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THE

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OF THE

HOUSE OF REPRESENTATIVES

FOR THE

SECOND SESSION OF THE FIFTY-SECOND CONGRESS.

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52d Congress, 2d Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 43.

REPORT

OF THE

TESTS OF METALS

AND

OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE FISCAL YEAR ENDED JUNE 30, 1892.

December 7, 1892.—Referred to the Committee on Manufactures and ordered to be printed.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1893.

LETTER

FROM

THE ACTING SECRETARY OF WAR,

TRANSMITTING

The report of the commanding officer of the Watertown Arsenal of tests of iron, steel, and other materials for industrial purposes, made during the fiscal year ending June 30, 1892.

DECEMBER 7, 1892.—Referred to the Committee on Manufactures and ordered to be printed.

WAR DEPARTMENT,
Washington, December 5, 1892.

SIR: In compliance with the provisions of the act of Congress entitled "An act making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1886, and for other purposes," approved March 3, 1885 (23 Stats., p. 502), I have the honor to transmit herewith the report of the commanding officer of the Watertown Arsenal of "Tests of iron, steel, and other materials for industrial purposes," made with the United States testing machine during the fiscal year ended June 30, 1892.

Very respectfully,

J. M. SCHOFIELD,
Major-General, Acting Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

WATERTOWN ARSENAL,
Watertown, Mass., November 22, 1892.

SIR: I have the honor to submit herewith the following report of tests of materials made at this arsenal during the fiscal year ending June 30, 1892, in compliance with the requirements of law.

The total number of specimens tested during the year is 2,469, classified as follows:

Gun specimens	845
For Ordnance Department	187
For other Government departments	106
Investigation tests	412
Tests for private parties	909

The receipts and expenditures were as follows:

Amount appropriated for testing machine and testing work	$10,000.00
Received during the year for private tests	1,363.13
Total received	11,363.13
Amount expended for services and labor	8,749.26
Amount expended for light, power, tools, implements, and material for test	2,613.87
Total expended	11,363.13

As a matter of general interest it may be advisable to repeat the rules governing the operations of the testing machine.

All tests are comprised under three classes:

(1) Tests made for the various departments of the Government.

(2) Tests made for private parties.

(3) Investigation tests.

The first and third series of tests are made at public expense; the second series are made upon application to the commanding officer of the arsenal, and are paid for by the parties for whom the tests are made. A list of the parties availing themselves of this privilege is appended to the report.

The first series of tests is generally upon specimens representing material used in the current service of the various departments of the Government, and has for its object the determination of the physical qualities of the material presented for acceptance. The record of these tests is found in the first part of the accompanying report.

Investigative tests have been continued upon the following subjects:

Alternate strains in iron and steel; the hardening and tempering of steel; the endurance of bars subjected to repeated transverse stresses in the form of rotating shafts; steel rails, driving-wheel tires, and axles in the class of railway material; also some observations on the effects of heat transmission and the strength of hot stones, together with a number of tests upon isolated features of interest which are not included in the more comprehensive series of investigations.

The series of tests on the effects of alternate strains by direct tension and compression has been completed.

The data contained in this and preceding reports supply some very important information upon the immediate effects of overstraining by alternate stresses, and the influence of time in modifying or effacing these effects.

The endurance tests of rotating shafts take up a line of investigation closely allied to the above series.

In both series attention has been centered upon the phases of deterioration which the metal undergoes prior to rupture—fundamental information when considering questions of permanency in metallic structures.

The effects of repeated transverse stresses on the direct tensile strength of the metal has been shown by means of annular specimens taken from shafts that have worked under different fiber stresses and different periods of rotation, the records in the body of the report showing wherein there has been gain or loss over the primitive strength of the metal, according to conditions of the tests.

Endurance tests of rotating shafts are in continuance, and it is intended to fully investigate the effects of overstraining and repeated stresses as exemplified in the annular specimens taken from these shafts, and furthermore investigating the effects of annealing on the strength of material after different periods of exposure to overloads.

Preliminary experiments on hardening and tempering steel with special reference to the manufacture of Belleville springs for sea-coast gun carriages have been carried on, and it is intended to extend the observations to a general investigation of the subject of tempering of steel, operating with steels covering a wide range in chemical composition.

Much obscurity at present surrounds this subject, and it is not generally understood what treatment is necessary to produce maximum results as regards strength, or how the physical properties may be controlled by varying the tempering methods.

Additional tests were made with steel rails and the peculiarities observed in the tests of the previous year received further confirmation—that is, in regard to the loss in ductility of the metal in the heads of old rails—by reason of which old rails are found low in strength and toughness when bent transversely with the head on the tension side of the bend, whereas bending in the opposite direction develops greater strength and toughness.

The apparatus has been completed for testing the section of an 8-inch tube by hydrostatic pressure, and a comprehensive series of tests will be undertaken during the present fiscal year, which will embrace observations within the elastic limit of the metal upon the effects of interior and exterior pressures acting singly and together, also when accompanied with longitudinal stresses of tension and of compression.

Very respectfully, your obedient servant,

J. W. REILLY,
Major, Ord. Dept., U. S. Army, Commanding.

The CHIEF OF ORDNANCE, U. S. ARMY,
Washington, D. C.

REPORT

OF THE

TESTS OF METALS AND OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN
ARSENAL, MASSACHUSETTS,

DURING THE

FISCAL YEAR ENDED JUNE 30, 1892.

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3.2-INCH B. L. STEEL FIELD GUNS.

SPECIMENS FROM TUBES AND JACKETS.

TUBE NO. 115.

No. 4514.

Marks, $\begin{smallmatrix}32\ R_{115}\ T\\ B\ T_1\ M\end{smallmatrix}$
Diameter, ''.505.
Sectional area, .20 square inch.
Gauged length, 2''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000200	.000100	....	....	
4,000	20,000	.000600	.000400	....	....	
6,000	30,000	.000900	.000300	....	....	
7,000	35,000	.001050	.000150	0.	....	
8,000	40,000	.001150	.000100	....	....	
8,400	42,000	.001200	.000050	—.000050	—.000050	
8,600	43,000	.001250	.000050	....	....	
8,800	44,000	.001300	.000050	....	....	
9,000	45,000	.001350	.000050	....	....	
9,200	46,000	.001400	.000050	....	....	
9,400	47,000	.001450	.000050	....	....	Elastic limit.
9,600	48,000	.002500	.001050	....	....	
9,800	49,000	.003500	.001000	....	....	
10,000	50,000	.005000	.001500	....	....	
10,200	51,000	.006000	.001000	....	....	
10,400	52,000	.008100	.002100	....	....	
16,980	84,900	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,900
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.1900
Elongation per inch under strain at elastic limit	do...	.001450
Reduction in diameter at point of rupture	do...	.095
Reduction in area after rupture, per cent of original section		34.0
Position of rupture		''.7 from neck
Character of broken surface		silky serrated, 80 per cent; granular, 20 per cent
Elongation of inch sections		''.29*, ''.09

TUBE NO. 116.

No. 4519.

Marks, $\begin{smallmatrix}82\ R_{14}\ T\\ M\ T_{1}\ M\end{smallmatrix}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000250	.000150	....	....	
4,000	20,000	.000550	.000300	....	....	
6,000	30,000	.000900	.000350	....	....	
7,000	35,000	.001100	.000200	0.	....	
8,000	40,000	.001350	.000250	....	....	
8,400	42,000	.001450	.000100	0.	....	
8,600	43,000	.001500	.000050	....	....	Elastic limit.
8,800	44,000	.001700	.000200	....	....	
9,000	45,000	.002500	.000800	....	....	
9,200	46,000	.004900	.002400	....	....	
9,400	47,000	.006150	.001250	....	....	
9,600	48,000	.007400	.001250	....	....	
16,870	84,350	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,350
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	.2500
Elongation per inch under strain at elastic limit	do...	.001500
Reduction in diameter at point of rupture	do...	.135
Reduction in area after rupture, per cent of original section		46.2
Position of rupture		1″.05 from neck
Character of broken surface		silky
Elongation of inch sections		″.16, ″.34

TUBE NO. 117.

No. 4520.

Marks, $\genfrac{}{}{0pt}{}{32\ \mathrm{R}_{11}\ \mathrm{T}}{\mathrm{B\ T_2\ M}}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000350	.000250	....	....	
4,000	20,000	.000600	.000250	....	....	
6,000	30,000	.000850	.000250	....	....	
7,000	35,000	.001100	.000250	—.000050	—.000050	
8,000	40,000	.001200	.000100	....	....	
8,400	42,000	.001250	.000050	—.000050	0.	
8,600	43,000	.001250	0.	....	....	
8,800	44,000	.001300	.000050	....	....	
9,000	45,000	.001350	.000050	....	....	
9,200	46,000	.001450	.000100	....	....	
9,400	47,000	.001500	.000050	....	....	
9,600	48,000	.001550	.000050	....	....	Elastic limit.
9,800	49,000	.003500	.001950	....	....	
10,000	50,000	.005000	.001500	....	....	
10,200	51,000	.007350	.002350	....	....	
10,400	52,000	.008500	.001150	....	....	
10,600	53,000	.009500	.001000	....	....	
17,040	85,200	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,200
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.1850
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.105
Reduction in area after rupture, per cent of original section		37.1
Position of rupture		″.45 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.09, ″.28*

TUBE No. 120.

No. 4521.

Marks, $\genfrac{}{}{0pt}{}{82\ E_{12}\ T}{B\ T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000250	.000150	....	....	
4,000	20,000	.000550	.000300	....	....	
6,000	30,000	.000900	.000350	....	....	
7,000	35,000	.001100	.000200	0.	....	
8,000	40,000	.001250	.000150	....	....	
8,200	41,000	.001300	.000050	....	....	Elastic limit.
8,400	42,000	.006150	.004850	.004400	.004400	
8,600	43,000	.006900	.000750	....	....	
8,800	44.000	.007800	.000900	....	....	
9,000	45,000	.008900	.001100	....	....	
9,200	46,000	.010000	.001100	....	....	
16,010	80,050	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,050
Elastic limit per square inch of original section	do...	41,000
Elongation per inch after rupture	inch..	.2450
Elongation per inch under strain at elastic limit	do...	.001300
Reduction in diameter at point of rupture	do...	.105
Reduction in area after rupture, per cent of original section		37.1
Position of rupture		″.80 from neck
Character of broken surface		silky serrated, trace of granulation
Elongation of inch sections		″.34*, ″.15

TUBE NO. 122.

No. 4522.

Marks, $\frac{32\text{ R, }_{12}\text{ T}}{\text{B T, M}}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000250	.000150	....	....	
4,000	20,000	.000600	.000350	....	....	
6,000	30,000	.000950	.000350	....	....	
7,000	35,000	.001150	.000200	0.	....	
8,000	40,000	.001350	.000200	....	....	
8,400	42,000	.001450	.000100	.000050	.000050	
8,600	43,000	.001450	0.	....	....	
8,800	44,000	.001500	.000050	....	....	
9,000	45,000	.001600	.000100	....	....	Elastic limit.
9,200	46,000	.003900	.002300	....	....	
9,400	47,000	.007100	.003200	....	....	
9,600	48,000	.008000	.000900	....	....	
9,800	49,000	.009050	.001050	....	....	
10,000	50,000	.010100	.001050	....	....	
16,150	80,750	....	....	....	....	Tensile strength

General summary.

Tensile strength per square inch of original section	pounds..	80,750
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.2100
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.135
Reduction in area after rupture, per cent of original section		46.2
Position of rupture		″.50 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.23*, ″.09

JACKET NO. 108.

No. 4515.

Marks, $\begin{smallmatrix}32 & R_{10} & J\\ M & T, & M\end{smallmatrix}$
Diameter, ''.505.
Sectional area, .20 square inch.
Gauged length, 2''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000200	.000100	....	....	
4,000	20,000	.000550	.000350	....	....	
6,000	30,000	.000850	.000300	....	....	
8,000	40,000	.001200	.000350	0.	....	
9,200	46,000	.001500	.000300	0.	....	
9,400	47,000	.001550	.000050	....	....	
9,600	48,000	.001600	.000050	....	....	
9,800	49,000	.001600	0.	....	....	
10,000	50,000	.001650	.000050	....	....	Elastic limit.
10,200	51,000	.001850	.000200	....	....	
10,400	52,000	.003400	.001550	....	....	
10,600	53,000	.004400	.001000	....	....	
10,800	54,000	.005400	.001000	....	....	
11,000	55,000	.006500	.001100	....	....	
18,410	92,050	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,050
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2350
Elongation per inch under strain at elastic limit	do...	.001650
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1''.20 from neck
Character of broken surface		silky
Elongation of inch sections		''.21*, ''.26*

JACKET NO. 110.

No. 4518.

Marks, $\substack{32\ \mathrm{R}_{11}\ \mathrm{J} \\ \mathrm{M\ T_3\ M}}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000250	.000150	....	....	
4,000	20,000	.000550	.000300	....	....	
6,000	30,000	.000850	.000300	....	....	
8,000	40,000	.001300	.000450	0.	....	
9,200	46,000	.001500	.000200	0.	....	
9,400	47,000	.001500	0.	....	....	
9,600	48,000	.001550	.000050	....	....	
9,800	49,000	.001600	.000050	....	....	
10,000	50,000	.001650	.000050	....	....	
10,200	51,000	.001650	0.	....	....	
10,400	52,000	.001700	.000050	....	....	Elastic limit.
10,600	53,000	.002500	.000800	....	....	
10,800	54,000	.004600	.002100	....	....	
11,000	55. 000	.005550	.000950	....	....	
11,200	56,000	.006900	.001350	....	....	
11,400	57,000	.008000	.001100	....	....	
18,340	91,700	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,700
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	.2250
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1″.25 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.25*, ″.20

JACKET NO. 111.

No. 4517.

Marks, $\substack{32\ R_{11}\ J \\ M\ T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000350	.000250	....	....	
4,000	20,000	.000600	.000250	....	....	
6,000	30,000	.000900	.000300	....	....	
8,000	40,000	.001350	.000450	0.	....	
9,200	46,000	.001550	.000200	0.	....	
9,400	47,000	.001600	.000050	....	....	
9,600	48,000	.001600	0.	....	....	
9,800	49,000	.001650	.000050	....	....	
10,000	50,000	.001750	.000100	....	....	
10,200	51,000	.001850	.000100	....	....	
10,400	52,000	.001900	.000050	....	....	Elastic limit.
10,600	53,000	.002100	.000200	....	....	
10,800	54,000	.002900	.000800	....	....	
11,000	55,000	.003900	.001000	....	....	
11,200	56,000	.005250	.001350	....	....	
11,400	57,000	.006500	.001250	....	....	
18,520	92,600	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds..	92,600
Elastic limit per square inch of original section ....do...	52,000
Elongation per inch after rupture ....inch..	.2000
Elongation per inch under strain at elastic limit ....do...	.001900
Reduction in diameter at point of rupture ....do...	.105
Reduction in area after rupture, per cent of original section	37.1
Position of rupture	1″.15 from neck
Character of broken surface	granular 60 per cent, silky serrated 40 per cent
Elongation of inch sections	″.21*, ″.19

JACKET No. 113.

No. 4516.

Marks, $\overset{32\ R_{113}\ J}{M\ T,\ I}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1, 000	0.	0.	0.	0.	Initial load.
1, 000	5, 000	.000100	.000100	0.	....	
2, 000	10, 000	.000350	.000250	....	....	
4, 000	20, 000	.000600	.000250	....	....	
6, 000	30, 000	.000900	.000300	....	....	
8, 000	40, 000	.001350	.000450	0.	....	
9, 200	46, 000	.001550	.000200	0.	....	Elastic limit.
9, 400	47, 090	.003350	.001800	....	....	
9, 600	48, 000	.005350	.002000	....	....	
9, 800	49, 000	.008900	.003550	....	....	
10, 000	50, 000	.010000	.001100	....	....	
10. 200	51, 000	.011200	.001200	....	....	
16, 690	83, 450	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83, 450
Elastic limit per square inch of original section	do...	46, 000
Elongation per inch after rupture	inch..	.2450
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43. 3
Position of rupture		1″.12 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.29*, ″.20

JACKET NO. 114.

No. 4523.

Marks, $\substack{82\,R_{114}J \\ M\,T_1\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1, 000	0.	0.	0.	0.	Initial load.
1, 000	5, 000	.000100	.000100	0.	....	
2, 000	10, 000	.000350	.000250	....	....	
4, 000	20, 000	.000600	.000250	....	....	
6, 000	30, 000	.000900	.000300	....	....	
8, 000	40, 000	.001350	.000450	.000050	.000050	
9, 200	46, 600	.001500	.000150	....	0.	
9, 400	47, 000	.001550	.000050	....	....	
9, 600	48, 000	.001600	.000050	....	....	
9, 800	49, 000	.001650	.000050	....	....	
10, 000	50, 000	.001700	.000050	....	....	Elastic limit.
10, 200	51, 000	.002050	.000350	....	....	
10, 400	52, 000	.002600	.000550	....	....	
10, 600	53, 000	.003550	.000950	....	....	
10, 800	54, 000	.004900	.001350	....	....	
11, 000	55, 000	.006050	.001150	....	....	
18, 410	92, 050	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92, 050
Elastic limit per square inch of original section	do...	50. 000
Elongation per inch after rupture	inch..	.2350
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43. 3
Position of rupture		1.″1 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.16,″.31

TABULATION OF TENSION SPECIMENS FROM 3.2-INCH B. L. STEEL FIELD GUNS.

[Stems 2 inches long, ″.505 diameter.]

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent*	*Per cent.*	
4514	Tube No. 115....	Middle.	47, 000	84, 900	19. 0	34. 0	Silky serrated 80 per cent, granular 26 per cent.*
4519	Tube No. 116....	...do ...	43, 000	84, 350	25. 0	46. 2	Silky.†
4520	Tube No. 117....	...do ...	48, 000	85, 200	18. 5	37. 1	Silky, serrated.*
4521	Tube No. 120....	...do ...	41, 000	80, 050	24. 5	37. 1	Silky, serrated, trace of granulation.*
4522	Tube No. 122....	...do ...	45, 000	80, 750	21. 0	46. 2	Silky, serrated.*
4515	Jacket No. 108..	Middle.	50, 000	92, 050	23. 5	43. 3	Silky.†
4518	Jacket No. 110..	...do ...	52, 000	91, 700	22. 5	43. 3	Silky, serrated.†
4517	Jacket No. 111..	...do ...	52, 000	92, 600	20. 0	37. 1	Granular 60 per cent; silky, serrated 40 per cent.†
4516	Jacket No. 113..	Inside .	46, 000	83, 450	24. 5	43. 3	Silky, serrated.†
4523	Jacket No. 114..	Middle.	50, 000	92, 050	23. 5	43. 3	Do.†

* Breech end. † Muzzle end.

3.6-INCH B. L. STEEL FIELD RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE NO. 1.

No. 4685.

Marks, $^{36\ \mathrm{R,\ T}}_{\mathrm{B\ T,\ M}}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000350	.000250	....	....	
4,000	20,000	.000700	.000350	....	....	
6,000	30,000	.001000	.000300	....	....	
7,000	35,000	.001200	.000200	0.	....	
8,000	40,000	.001350	.000150	....	....	
8,400	42,000	.001400	.000050	0.	....	
8,600	43,000	.001450	.000050	....	....	
8,800	44,000	.001450	0.	....	....	
9,000	45,000	.001500	.000050	....	....	
9,200	46,000	.001500	0.	....	....	
9,400	47,000	.001550	.000050	....	....	
9,600	48,000	.001550	0.	....	....	
9,800	49,000	.001600	.000050	....	....	
10,000	50,000	.001600	0.	....	....	
10,200	51,000	.001650	.000050	....	....	Elastic limit.
10,400	52,000	.002200	.000550	....	....	
10,600	53,000	.004000	.001800	....	....	
10,800	54,000	.006250	.002250	....	....	
11,000	55,000	.007250	.001000	....	....	
11,200	56,000	.007950	.000700	....	....	
18,620	93,100	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,100
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.1700
Elongation per inch under strain at elastic limit	do...	.001650
Reduction in diameter at point of rupture	do...	.065
Reduction in area after rupture, per cent of original section		23.9
Position of rupture		".5 from neck
Character of broken surface		granular, silky spot at circumference.
Elongation of inch sections		*".14, ".20

TUBE No. 2.

No. 4686.

Marks, $\begin{smallmatrix}36\ R,\ T\\ M\ T,\ M\end{smallmatrix}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	....	
2,000	10,000	.000300	.000250	....	....	
4,000	20,000	.000650	.000350	....	....	
6,000	30,000	.001000	.000350	....	....	
7,000	35,000	.001100	.000100	0.	....	
8,000	40,000	.001250	.000150	....	....	
8,400	42,000	.001350	.000100	0.	....	
8,600	43,000	.001400	.000050	....	....	
8,800	44,000	.001450	.000050	....	....	
9,000	45,000	.001450	0.	....	....	
9,200	46,000	.001500	.000050	....	....	
9,400	47,000	.001550	.000050	....	....	
9,600	48,000	.001600	.000050	....	....	
9,800	49,000	.001650	.000050	....	....	
10,000	50,000 {	.001700 .002600	.000050 .000900	....	....	Elastic limit.
10,200	51,000	.003250	.000650	....	....	
10,400	52,000	.004000	.000750	....	....	
10,600	53,000	.006000	.002000	....	....	
10,800	54,000	.008000	.002000	....	....	
11,000	55,000	.009000	.001000	....	....	
17,970	89,850	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	89,850
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	.2050
Elongation per inch under strain at elastic limit	do	.001700
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per cent of original section		37.1
Position of rupture		.70 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		*″.30, ″.11

TUBE No. 3.

No. 4687.

Marks, $\genfrac{}{}{0pt}{}{36\ \mathrm{R,\ T}}{\mathrm{B\ T,\ O}}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	....	
2,000	10,000	.000200	.000150	....	....	
4,000	20,000	.000600	.000200	....	....	
6,000	30,000	.000950	.000350	....	....	
7,000	35,000	.001100	.000150	0.	....	
8,000	40,000	.001250	.000150	....	....	
8,400	42,000	.001300	.000050	0.	....	
8,600	43,000	.001350	.000050	....	....	
8,800	44,000	.001400	.000050	....	....	
9,000	45,000	.001450	.000050	....	....	
9,200	46,000	.001450	0.	....	....	
9,400	47,000	.001500	.000050	....	....	
9,600	48,000	.001500	0.	....	....	
9,800	49,000	.001550	.000050	....	....	
10,000	50,000	.001550	0.	....	....	Elastic limit.
10,200	51,000	.004950	.003400	....	....	
10,400	52,000	.008250	.003300	....	....	
10,600	53,000	.009450	.001200	....	....	
10,800	54,000	.010250	.000800	....	....	
11,000	55,000	.010750	.000500	....	....	
17,840	89,200	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	89,200
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	.2450
Elongation per inch under strain at elastic limit	do	.001550
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1″.22 from neck
Character of broken surface		silky
Elongation of inch sections		″.22, ″.27*

TUBE No. 13.

No. 4712.

Marks, $\substack{36\ R_{13}\ T \\ M\ T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	....	
2,000	10,000	.000400	.000250	....	....	
4,000	20,000	.000650	.000250	....	....	
6,000	30,000	.001050	.000400	....	....	
7,000	35,000	.001300	.000250	.0	....	
8,000	40,000	.001500	.000200	....	....	
8,400	42,000	.001550	.000050	.0	....	
8,600	43,000	.001600	.000050	....	....	
8,800	44,000	.001600	0.	....	....	
9,000	45,000	.001650	.000050	....	....	
9,200	46,000	.001700	.000050	....	....	Elastic limit.
9,400	47,000	.003300	.001600	....	....	
9,600	48,000	.005050	.001750	....	....	
9,800	49,000	.006000	.000950	....	....	
10,000	50,000	.007000	.001000	....	....	
10,200	51,000	.008500	.001500	....	....	
17,120	85,600	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,600
Elastic limit per square inch of original section	do...	46,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		49.1
Position of rupture		″.75 from neck.
Character of broken surface		Silky.
Elongation of inch sections		″.34*, ″.10

TUBE NO. 14.

No. 4711.

Marks, $^{36\ R_{14}\ T}_{\ \ B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000400	.000300	....	....	
4,000	20,000	.000850	.000450	....	....	
6,000	30,000	.001200	.000350	....	....	
7,000	35,000	.001450	.000250	0.	....	
8,000	40,000	.001650	.000200	....	....	
8,200	41,000	.001700	.000050	....	....	Elastic limit.
8,400	42,000	.012550	.010850	.010550	.010550	
8,600	43,000	.012800	.000250	....	....	
8,800	44,000	.013050	.000250	....	....	
9,000	45,000	.013600	.000550	....	....	
9,200	46,000	.015000	.001400	....	....	
15,740	78,700	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	78,700
Elastic limit per square inch of original section	do...	41,000
Elongation per inch after rupture	inch..	.1400
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.045
Reduction in area after rupture, per cent of original section		16.9
Position of rupture		1″.1 from neck
Character of broken surface		granular, silky spot near the circumference
Elongation of inch sections		″.12, ″.16

JACKET No. 9.

No. 4695.

Marks, $\overset{36\ R,\ J}{M\ T,\ I}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1. 000	0.	0.	0.	0.	Initial load.
1, 000	5, 000	.000100	.000100	0.	....	
2, 000	10, 000	.000300	.000200	....	....	
4, 000	20, 000	.000500	.000200	....	....	
6, 000	30, 000	.000850	.000350	....	....	
8, 000	40, 000	.001200	.000350	0.	....	
9, 200	46, 000	.001800	.000600	0.	....	
9, 400	47, 000	.001800	0.	....	....	
9, 600	48, 000	.001850	.000050	....	....	
9, 800	49, 000	.001960	.000050	....	....	Elastic limit.
10, 000	50, 000	.002200	.000300	....	....	
10, 200	51, 000	.003100	.000900	....	....	
10, 400	52, 000	.003600	.000500	....	....	
10, 600	53, 000	.004500	.000900	....	....	
10, 800	54, 000	.006750	.002250	....	....	
19, 580	97, 900	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97, 900
Elastic limit per square inch of original section	do...	49, 000
Elongation per inch after rupture	inch..	.175
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.085
Reduction in area after rupture, per cent of original section		30. 7
Position of rupture		".65 from neck
Character of broken surface		granular 80 per cent, silky 20 per cent.
Elongation of inch sections		".25*, ".10

JACKET No. 12.

No. 4696.

Marks, $\substack{36\ R_{12}\ J \\ M\ T_{2}\ I}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000300	.000200	....	....	
4,000	20,000	.000700	.000400	....	....	
6,000	30,000	.001050	.000350	....	....	
8,000	40 000	.001400	.000350	0.	....	
9,200	46,000	.001600	.000200	0.	....	
9,400	47,000	.001650	.000050	....	....	
9,600	48,000	.001700	.000050	....	....	
9,800	49,000	.001750	.000050	....	....	
10,000	50,000	.001800	.000050	....	....	
10,200	51,000	.001900	.000100	....	....	
10,400	52,000	.001950	.000050	....	....	
10,600	53,000	.002000	.000050	....	....	
10,800	54,000	.002000	0.	....	....	Elastic limit.
11,000	55,000	.002200	.000200	....	....	
11,200	56,000	.003000	.000800	....	....	
11,400	57,000	.004500	.001500	....	....	
11,600	58,000	.005750	.001250	....	....	
11,800	59,000	.007000	.001250	....	....	
19,520	97,600	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds..	97,600
Elastic limit per square inch of original section ....do...	54,000
Elongation per inch after rupture ....inch..	.205
Elongation per inch under strain at elastic limit ....do...	.002000
Reduction in diameter at point of rupture ....do...	.115
Reduction in area after rupture, per cent of original section	40.3
Position of rupture	″.75 from neck
Character of broken surface	silky
Elongation of inch sections	″.11, ″.30

JACKET No. 14.

No. 4708.

Marks, $\substack{86\ R_{14}\ J. \\ M\ T,\ I.}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000400	.000300	....	....	
4,000	20,000	.000700	.000300	....	....	
6,000	30,000	.001050	.000350	....	....	
8,000	40,000	.001450	.000400	.000050	.000050	
9,200	46,000	.001650	.000200	.000050	0.	
9,400	47,000	.001700	.000050	....	....	
9,600	48,000	.001750	.000050	....	....	Elastic limit.
9,800	49,000	.001950	.000200	....	....	
10,000	50,000	.002400	.000450	....	....	
10,200	51,000	.003500	.001100	....	....	
10,400	52,000	.004500	.001000	....	....	
10,600	53,000	.005350	.000850	....	....	
18,940	94,700	....	....	....	....	Tensile strength.

General Summary.

Tensile strength per square inch of original section	pounds..	94,700
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2250
Elongation per inch under strain at elastic limit	do...	.001750
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1″.1 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.17

JACKET No. 17.

No. 47163.

Marks, $\genfrac{}{}{0pt}{}{^{86}\mathrm{R}\,_{17}\,\mathrm{J}}{\mathrm{B\,T,\,O}}$
Diameter, ″.505 square inch.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000400	.000300			
4,000	20,000	.000650	.000250			
6,000	30,000	.001000	.000350			
8,000	40,000	.001400	.000400	0.		
9,200	46,000	.001600	.000200	.000050	.000050	
9,400	47,000	.001650	.000050			
9,600	48,000	.001750	.000100			
9,800	49,000	.001800	.000050			Elastic limit.
10,000	50,000	{ .002000 .002500	.000200 .000500			
10,200	51,000	.004100	.001600			
10,400	52,000	.005500	.001400			
10,600	53,000	.006600	.001100			
10,800	54,000	.007550	.000950			
17,610	88,050					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,050
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2400
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		″.22*, ″.26*

JACKET No. 19.

No. 4714.

Marks, $\genfrac{}{}{0pt}{}{36\ R_1,\ J}{M\ T_2,\ I}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000350	.000250	....	....	
4,000	20,000	.000600	.000250	....	....	
6,000	30,000	.000950	.000350	....	....	
8,000	40,000	.001300	.000350	0.	....	
9,200	46,000	.001550	.000250	0.	....	
9,400	47,000	.001600	.000050	....	....	Elastic limit.
9,600	48,000	.002600	.001000	....	....	
9,800	49,000	.004500	.001900	....	....	
10,000	50,000	.006450	.001950	....	....	
10,200	51,000	.007200	.000750	....	....	
10,400	52,000	.008500	.001300	....	....	
17,410	87,050	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,050
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2450
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1".1 from neck
Character of broken surface		silky
Elongation of inch sections		".16, ".33*

TABULATION OF TENSION SPECIMENS FROM 3.6-INCH B. L. STEEL FIELD RIFLES.

[Stems 2 inches long, ".505 diameter.]

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per ct.*	*Per ct.*	
4685	Tube No. 1	Middle	51,000	93,100	17.0	23.9	Granular, silky spot.*
4686	Tube No. 2	...do	50,000	89,850	20.5	37.1	Silky, serrated.†
4687	Tube No. 3	Outside	50,000	89,200	24.5	43.3	Silky.*
4712	Tube No. 13	Middle	46,000	85,600	22.0	49.1	Do.†
4711	Tube No. 14	...do	41,000	78,700	14.0	16.9	Granular, silky spot.*
4695	Jacket No. 9	Inside	49,000	97,900	17.5	30.7	Granular 80 per cent, silky 20 per cent.†
4696	Jacket No. 12	...do	54 000	97,600	20.5	40.3	Silky.†
4708	Jacket No. 14	...do	48,000	94,700	22.5	43.8	Do.†
4713	Jacket No. 17	Outside	49,000	88,050	24.0	43.3	Do.*
4714	Jacket No. 19	Inside	47,000	87,050	24.5	43.3	Do.†

* Breech end. † Muzzle end.

3.6-INCH STEEL B. L. FIELD MORTARS.

SPECIMENS FROM STEEL BODIES.

BODY No. 3.

No. 4535.

Marks, $^{36\ \text{M, B}}_{\text{B T, M}}$
Diameter, ″.502.
Sectional area, .198 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
198	1,000	0.	0.	0.	0.	Initial load.
990	5,000	.000100	.000100	0.	....	
1,980	10,000	.000300	.000200	....	....	
3,960	20,000	.000600	.000300	....	....	
5,940	30,000	.001000	.000400	....	....	
6,930	35,000	.001200	.000200	0.	....	
7,920	40,000	.001400	.000200	....	....	
8,316	42,000	.001450	.000050	0.	....	
8,514	43,000	.001450	0.	....	....	
8,712	44,000	.001500	.000050	....	....	
8,910	45,000	.001550	.000050	....	....	
9,108	46,000	.001600	.000050	....	....	
9,306	47,000	.001600	0.	....	....	
9,504	48,000	.001650	.000050	....	....	
9,702	49,000	.001650	0.	....	....	
9,900	50,000	.001700	.000050	....	....	
10,098	51,000	.001800	.000100	....	....	
10,296	52,000	.001850	.000050	....	....	
10,494	53,000	.001900	.000050	....	....	
10,692	54,000	.001950	.000050	....	....	Elastic limit.
10,890	55,000	.002450	.000500	....	....	
11,088	56,000	.004650	.002200	....	....	
11,286	57,000	.005750	.001100	....	....	
11,484	58,000	.006600	.000850	....	....	
11,682	59,000	.007850	.001250	....	....	
19,490	98,430	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section........pounds..	98,430
Elastic limit per square inch of original section........do...	54,000
Elongation per inch after rupture........inch..	.220
Elongation per inch under strain at elastic limit........do...	.001950
Reduction in diameter at point of rupture........do...	.062
Reduction in area after rupture, per cent of original section........	36.4
Position of rupture........	″.85 from neck
Character of broken surface........	silky
Elongation of inch sections........	″.22* ″.12

BODY NO. 6.

No. 4536.

Marks, $^{36\,M,\,B}_{BT,\,M}$
Diameter, ″.500.
Sectional area, .196 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
196	1, 000	0.	0.	0.	0.	Initial load.
980	5, 000	.000100	.000100	0.	....	
1, 960	10, 000	.000300	.000200	....	....	
3, 920	20, 000	.000600	.000300	....	....	
5, 880	30. 000	.001000	.000400	....	....	
6, 860	35, 000	.001150	.000150	0.	....	
7, 840	40, 000	.001350	.000200	....	....	
8, 232	42, 000	.001450	.000100	0.	....	
8, 428	43. 000	.001450	0.	....	....	
8, 624	44, 000	.001500	.000050	....	....	
8, 820	45, 000	.001500	0.	....	....	
9, 016	46, 000	.001550	.000050	....	....	
9, 212	47, 000	.001600	.000050	....	....	
9, 408	48, 000	.001600	0.	....	....	
9, 604	49, 000	.001650	.000050	....	....	
9, 800	50, 000	.001650	0.	....	....	
9, 996	51, 000	.001700	.000050	....	....	
10, 192	52, 000	.001750	.000050	....	....	
10 388	53, 000	.001800	.000050	....	....	
10, 584	54, 000	.001900	.000100	....	....	
10, 780	55, 000	.001950	.000050	....	....	Elastic limit.
10, 976	56, 000	.003250	.001300	....	....	
11, 172	57, 000	.005500	.002250	....	....	
11, 368	58, 000	.006100	.000600	....	....	
11, 564	59, 000	.007350	.001250	....	....	
11, 760	60, 000	.008100	.000750	....	....	
19, 460	99, 290	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99, 290
Elastic limit per square inch of original section	do...	55, 000
Elongation per inch after rupture	inch..	.205
Elongation per inch under strain at elastic limit	do...	.001950
Reduction in diameter at point of rupture	do...	.110
Reduction in area after rupture, per cent of original section		39.3
Position of rupture		1″. 15 from neck
Character of broken surface		silky
Elongation of inch sections		″.23*, ″18

BODY No. 16.

No. 4537.

Marks, $\substack{36\,M_{14}\,B \\ B\,T,\,M}$
Diameter, ″.502.
Sectional area, .198 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch	Successive elongation per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
198	1,000	0.	0.	0.	0.	Initial load.
990	5,000	.000100	.000100	0.		
1,980	10,000	.000250	.000150			
3,960	20,000	.000550	.000300			
5,940	30,000	.000950	.000400			
6,930	35,000	.001050	.000100	0.		
7,920	40,000	.001300	.000250			
8,316	42,000	.001350	.000050	0.		
8,514	43,000	.001350	0.			
8,712	44,000	.001400	.000050			
8,910	45,000	.001450	.000050			
9,108	46,000	.001500	.000050			
9,306	47,000	.001500	0.			
9,504	48,000	.001550	.000050			
9,702	49,000	.001600	.000050			
9,900	50,000	.001600	0.			
10,098	51,000	.001650	.000050			
10,296	52,000	.001650	0.			
10,494	53,000	.001700	.000050			
10,692	54,000	.001800	.000100			
10,890	55,000	.001900	.000100			Elastic limit.
11,088	56,000	.002600	.000700			
11,286	57,000	.003900	.001300			
11,484	58,000	.005350	.001450			
11,682	59,000	.006100	.000750			
11,880	60,000	.006900	.000800			
20,130	101,670					Tensile strength.

General summary.

Tensile strength, per square inch of original section	pounds..	101,670
Elastic limit, per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	.190
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.062
Reduction in area after rupture, per cent of original section		36.4
Position of rupture		″.9 from neck
Character of broken surface		silky, serrated, trace of granulation
Elongation of inch sections		″.11, ″.27*

5-INCH B. L. STEEL SIEGE RIFLES.

SPECIMENS FROM TUBE AND JACKET NO. 10,

TUBE NO. 10.

No. 4,524.

Marks, $\genfrac{}{}{0pt}{}{5\,\mathrm{R}\,{}_{10}\,\mathrm{T}}{\mathrm{B}\,\mathrm{T}\,{}_{5}\,\mathrm{M}}$

Diameter, ″.564.

Sectional area, .25 square inch.

Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000300	.000200	....	....	
5,000	20,000	.000600	.000300	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001100	.000167	0.	....	
10,000	40,000	.001267	.000167	....	....	
10,500	42,000	.001367	.000100	.000033	.000033	
10,750	43,000	.001400	.000033	....	....	
11,000	44,000	.001433	.000033	....	....	
11,250	45,000	.001467	.000034	....	....	Elastic limit.
11,500	46,000	.001600	.000133	....	....	
11,750	47,000	.001733	.000133	....	....	
12,000	48,000	.002100	.000367	....	....	
12,250	49,000	.003033	.000933	....	....	
12,500	50,000	.004367	.001334	....	....	
22,480	89,920	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,920
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do....	.001467
Reduction in diameter at point of rupture	do....	.184
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″.55 from neck
Character of broken surface		silky, 55 per cent; granular, 45 per cent
Elongation of inch sections		″.12, ″.35*, ″.13

JACKET NO. 10.

No. 4511.

Marks, $\frac{5\,R_{10}\,J}{B\,T_2\,M}$
Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	....	....	
10,000	40,000	.001367	.000367	0.	....	
11,000	44,000	.001467	.000100	0.	....	
11,250	45,000	.001500	.000033	....	....	
11,500	46,000	.001567	.000067	....	....	
11,750	47,000	.001600	.000033	....	....	Elastic limit.
12,000	48,000	.001800	.000200	....	....	
12,250	49,000	.003067	.001267	....	....	
12,500	50,000	.004667	.001600	....	....	
12,750	51,000	.005233	.000566	....	....	
13,000	52,000	.006067	.000834	....	....	
23,840	95,360	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section............pounds..	95,360
Elastic limit per square inch of original section............do...	47,000
Elongation per inch after rupture............inch..	.2000
Elongation per inch under strain at elastic limit............do...	.001600
Reduction in diameter at point of rupture............do...	.124
Reduction in area after rupture, per cent of original section............	39.2
Position of rupture............	1''.19 from neck
Character ot broken surface............	silky
Elongation of inch sections............	''.15, ''.26*, ''.19*

5-INCH B. L. STEEL SIEGE RIFLES.

SPECIFIC GRAVITY AND HARDNESS OF TUBE AND JACKET NO. 10.

No tension tests of these specimens.

Position in rifle.	Marks on specimens.	Specific gravity.	Hardness.
Tube.....	5 R_{10} T—B R_7 M............	7.8598	19.50
Jacket....	5 R_{10} J—B R_6 M............	7.8523	22.02

8-INCH STEEL B. L. RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE NO. 10.

No. 973.

Marks, $^{8\ R_{10}\ T}_{B\ T_{10}\ M}$
Length, 5″.
Diameter, 1″.102.
Sectional area, .953 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
953	1,000	0.	0.	0.	0.	Initial load.
4,765	5,000	.000125	.000125	0.	....	
9,530	10,000	.000250	.000125	....	....	
14,295	15,000	.000375	.000125	....	....	
19,060	20,000	.000550	.000175	....	....	
23,825	25,000	.000725	.000175	....	....	
28,590	30,000	.000875	.000150	....	....	
33,355	35,000	.001025	.000150	....	....	
38,120	40,000	.001225	.000200	.000025	.000025	
39,073	41,000	.001250	.000025	....	....	
40,026	42,000	.001275	.000025	....	....	
40,979	43,000	.001325	.000050	....	....	Elastic limit.
41,932	44,000	.001975	.000650	....	....	
42,885	45,000	.004500	.002525	.003000	.002975	
43,838	46,000	.004950	.000450	....	....	
44,791	47,000	.005150	.000500	....	....	
45 744	48,000	.006150	.000700	....	....	
46. 697	49,000	.006875	.000725	....	....	
47,650	50,000	.007500	.000625	.005825	.002825	
49,556	52,000	.008800	.001300	....	....	
51,462	54,900	.010225	.001425	....	....	
53,368	56,000	.011750	.001525	....	....	
55,274	58,000	.013500	.001750	....	....	
57,180	60,000	.014750	.001250	....	....	
59,086	62,000	.016225	.001475	....	....	
60,992	64,000	.017875	.001650	....	....	
62,898	66,000	.019775	.001900	....	....	
64,804	68,000	.021300	.001525	....	....	
66,710	70,000	.023100	.001800	....	....	
93,800	98,430	....	....	....	....	Ultimate strength.

Failed by triple flexure.

TUBE No. 22.

No. 956.

Marks, $^{8\ R\ T}_{B\ T,\ M}$
Length, 5″.
Diameter, 1.″128.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000125	.000125	....	....	
10,000	10,000	.000250	.000125	....	....	
15,000	15,000	.000400	.000150	....	....	
20,000	20,000	.000550	.000150	....	....	
25,000	25,000	.000725	.000175	....	....	
30,000	30,000	.000875	.000150	0.	....	
35,000	35,000	.001050	.000175	....	....	
40,000	40,000	.001200	.000150	0.	....	
45,000	45,000	.001375	.000175	....	....	
46,000	46,000	.001425	.000050	....	....	
47,000	47,000	.001450	.000025	....	....	
48,000	48,000	.001500	.000050	....	....	
49,000	49,000	.001550	.000050	....	....	Elastic limit.
50,000	50,000	.001600	.000050	....	....	
51,000	51,000	.001625	.000025	....	....	
52,000	52,000	.001725	.000100	....	....	
53,000	53,000	.001825	.000100	....	....	
54,000	54,000	.002150	.000325	....	....	
55,000	55,000	.002900	.000750	....	....	
56,000	56,000	.004150	.001250	....	....	
58,000	58,000	.005625	.001475	....	....	
60,000	60,000	.007250	.001625	....	....	
62,000	62,000	.008750	.001500	....	....	
64,000	64,000	.010100	.001350	....	....	
66,000	66,000	.011425	.001325	....	....	
68,000	68,000	.013125	.001700	....	....	
70,000	70,000	,014775	.001650	....	....	
72,000	72,000	.016275	.001500	....	....	
74,000	74,000	.017800	.001525	....	....	
76,000	76,000	.019525	.001725	....	....	
78,000	78,000	.021375	.001850	....	....	
107,720	107,720	....	....	....	....	U timate strength.

Failed by triple flexure

TUBE NO. 23.

NO. 957.

Marks, $^{8}_{B}{}^{R}_{T}{}^{8}_{4}{}^{T}_{M}$
Length, 5″.
Diameter, 1″.128.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total,	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000075	.000075	....	....	
10,000	10,000	.000225	.000150	....	....	
15,000	15,000	.000350	.000125	....	....	
20,000	20,000	.000500	.000150	....	....	
25,000	25,000	.000650	.000150	....	....	
30,000	30,000	.000800	.000150	0.	....	
35,000	35,000	.000950	.000150	....	....	
40,000	40,000	.001100	.000150	0.	....	
45,000	45,000	.001300	.000200	....	....	
46,000	46,000	.001350	.000050	....	....	
47,000	47,000	.001400	.000050	....	....	
48,000	48,000	.001475	.000075	....	....	
49,000	49,000	.001550	.000075	....	....	Elastic limit.
50,000	50,000	.005825	.004275	....	....	
51,000	51,000	.006450	.000625	....	....	
52,000	52,000	.007125	.000675	....	....	
53,000	53,000	.007700	.000575	....	....	
54,000	54,000	.008425	.000725	....	....	
55,000	55,000	.009025	.000600	....	....	
56,000	56,000	.009875	.000850	....	....	
58,000	58,000	.011475	.001600	....	....	
60,000	60,000	.013000	.001525	....	....	
62,000	62,000	.014650	.001650	....	....	
64,000	64,000	.016375	.001725	....	....	
66,000	66,000	.018125	.001750	....	....	
68,000	68,000	.019800	.001675	....	....	
70,000	70,000	.021675	.001875	....	....	
100,570	100,570	....	....	....	....	Ultimate strength.

Failed by triple flexure.

TUBE NO. 24.

No. 958.

Marks, $\frac{8\ R.\ T}{B\ T,\ M}$
Length, 5″.
Diameter, 1″.128.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000100	.000100	....	....	
10,000	10,000	.000250	.000150	....	....	
15,000	15,000	.000400	.000150	....	....	
20,000	20,000	.000550	.000150	....	....	
25,000	25,000	.000725	.000175	....	....	
30,000	30,000	.000925	.000200	.000025	.000025	
35,000	35,000	.001075	.000150	....	....	
40,000	40,000	.001250	.000175	.000025	0.	
45,000	45,000	.001425	.000175	....	....	
46,000	46,000	.001450	.000025	....	....	
47,000	47,000	.001500	.000050	....	....	Elastic limit.
48,000	48,000	.001750	.000250	....	....	
49,000	49,000	.003975	.002225	....	....	
50,000	50,000	.004875	.000900	....	....	
51.000	51,000	.005650	.000775	....	....	
52,000	52,000	.006375	.000725	....	....	
54,000	54,000	.007800	.001425	....	....	
56,000	56,000	.009525	.001725	....	....	
58,000	58,000	.011125	.001600	....	....	
60.000	60,000	.012700	.001575	....	....	
62 000	62,000	.014450	.001750	....	....	
64,000	64,000	.016050	.001600	....	....	
66.000	66,000	.017850	.001800	....	....	
68,000	68,000	.019825	.001975	....	....	
70,000	70,000	.021625	.001800	....	....	
103,100	103,100	....	....	....	....	Ultimate strength.

Failed by triple flexure.

JACKET No. 9.

No. 4721.

Marks $^{8\ R,\ J}_{B,\ T,\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	.0	.0	.0	.0	Initial load.
1, 250	5, 000	.000067	.000067	.0	....	
2, 500	10, 000	.000267	.000200	....	....	
5, 000	20, 000	.000600	.000333	....	....	
7, 500	30, 000	.000933	.000333	....	....	
10, 000	40, 000	.001267	.000334	.0	....	
11, 000	44, 000	.001400	.000133	.000033	.000033	
11, 250	45, 000	.001433	.000033	....	....	
11, 500	46, 000	.001467	.000034	....	....	
11, 750	47, 000	.001500	.000033	....	....	
12, 000	48, 000	.001567	.000067	....	....	
12, 250	49, 000	.001633	.000066	....	....	
12, 500	50, 000	.001667	.000034	....	....	Elastic limit.
12, 750	51, 000	.002000	.000333	....	....	
13, 000	52, 000	.003033	.001033	....	....	
13, 250	53, 000	.005700	.002667	....	....	
13, 500	54, 000	.007167	.001467	....	....	
13, 750	55, 000	.007833	.000666	....	....	
23, 080	92, 320	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	92, 320
Elastic limit per square inch of original section	do	50, 000
Elongation per inch after rupture	inch	.1933
Elongation per inch under strain at elastic limit	do	.001667
Reduction in diameter at point of rupture	do	.104
Reduction in area after rupture, per cent of original section		33. 5
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.18, ″.12

No. 4722.

Marks, $^{8\ R,\ J}_{M\ T,\ O}$
Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000133	.000133	0.	....	
2, 500	10, 000	.000333	.000200	....	....	
5, 000	20, 000	.000667	.000334	....	....	
7, 500	30, 000	.001000	.000333	....	....	
10, 000	40, 000	.001367	.000367	.000033	.000033	
11, 000	44, 000	.001567	.000200	.000033	0.	
11, 250	45, 000	.001600	.000033	....	....	
11, 500	46, 000	.001633	.000033	....	....	
11, 750	47, 000	.001667	.000034	....	....	
12, 000	48, 000	.001667	0.	....	....	
12, 250	49, 000	.001700	.000033	....	....	
12, 500	50, 000	.001767	.000067	....	....	Elastic limit.
12, 750	51, 000	.007800	.006033	....	....	
13, 000	52, 000	.008933	.001133	....	....	
13, 250	53, 000	.009833	.000900	....	....	
13, 500	54, 000	.010967	.001134	....	....	
13, 750	55, 000	.012000	.001033	....	....	
21, 170	84, 680	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section .... pounds..	84, 680
Elastic limit per square inch of original section .... do...	50, 000
Elongation per inch after rupture .... inch..	.2333
Elongation per inch under strain at elastic limit .... do...	.001767
Reduction in diameter at point of rupture .... do...	.154
Reduction in area after rupture, per cent of original section	47.2
Position of rupture	1''.7 from neck
Character of broken surface	silky
Elongation of inch sections	''.12, ''.39*, ''.19

JACKET NO. 21.

NO. 959.

Marks, $\substack{8\ R_{21}\ J \\ B\ T_3\ M}$
Length, 5″.
Diameter 1″.127.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000075	.000075	....	....	
10,000	10,000	.000225	.000150	....	....	
15,000	15,000	.000375	.000150	....	....	
20,000	20,000	.000550	.000175	....	....	
25,000	25,000	.000700	.000150	....	....	
30,000	30,000	.000875	.000175	0.	....	
35,000	35,000	.001050	.000175	....	....	
40,000	40,000	.001200	.000150	....	....	
45,000	45,000	.001375	.000175	....	....	
50,000	50,000	.001575	.000200	....	....	
51,000	51,000	.001650	.000075	....	....	Elastic limit.
52,000	52,000	.001850	.000200	....	....	
53,000	53,000	.003125	.001275	....	....	
54,000	54,000	.003900	.000775	....	....	
55,000	55,000	.004575	.000675	....	....	
56,000	56,000	.005500	.000925	....	....	
58,000	58,000	.006750	.001250	....	....	
60,000	60,000	.008275	.001525	....	....	
62,000	62,000	.009550	.001275	....	....	
64,000	64,000	.011000	.001450	....	....	
66,000	66,000	.012350	.001350	....	....	
68,000	68,000	.014125	.001775	....	....	
70,000	70,000	.015450	.001325	....	....	
72,000	72,000	.016975	.001525	....	....	
74,000	74,000	.017575	.000600	....	....	
76,000	76,000	.020325	.002750	....	....	
78,000	78,000	.022375	.002050	....	....	
110,300	110,300	....	....	....	....	Ultimate strength.

Failed by triple flexure.

JACKET NO. 22.

No. 960.

Marks, $\frac{8\ \mathrm{B_n}\ \mathrm{J}}{\mathrm{B}\ \mathrm{T_5}\ \mathrm{M}}$
Length, 5″.
Diameter, 1″.128.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	1, 000	0.	0.	0.	0.	Initial load.
5, 000	5, 000	.000100	.000100	....	....	
10, 000	10, 000	.000250	.000150	....	....	
15, 000	15, 000	.000375	.000125	....	....	
20, 000	20, 000	.000525	.000150	....	....	
25, 000	25, 000	.000700	.000175	....	....	
30, 000	30, 000	.000875	.000175	0.	....	
35, 000	35, 000	.001025	.000150	....	....	
40, 000	40, 000	.001200	.000175	....	....	
45, 000	45, 000	.001375	.000175	....	....	
50, 000	50, 000	.001575	.000200	0.	....	
51. 000	51, 000	.001650	.000075	....	....	Elastic limit.
52, 000	52, 000	.001750	.000100	....	....	
53, 000	53, 000	.002175	.000425	....	....	
54, 000	54, 000	.002900	.000725	....	....	
55, 000	55, 000	.003775	.000875	....	....	
56, 000	56, 000	.004625	.000850	....	....	
58, 000	58, 000	.006300	.001675	....	....	
60, 000	60, 000	.007825	.001525	....	....	
62, 000	62, 000	.009175	.001350	....	....	
64, 000	64, 000	.010575	.001400	....	....	
66, 000	66, 000	.012050	.001475	....	....	
68, 000	68, 000	.013650	.001600	....	....	
70, 000	70, 000	.015200	.001550	....	....	
72, 000	72, 000	.016750	.001550	....	....	
74, 000	74, 000	.018475	.001725	....	....	
76, 000	76, 000	.020100	.001625	....	....	
78, 000	78, 000	.022000	.001900	....	....	
80, 000	80, 000	.023700	.001700	....	....	
109, 980	109, 980	....	....	....	....	Ultimate strength.

Failed by triple flexure.

JACKET No. 23.

No. 961.

Marks, ${}^{8\,R_B\,J}_{B\,T,\,M}$
Length, 5″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000125	.000125	....	....	
10,000	10,000	.000250	.000125	....	....	
15,000	15,000	.000400	.000150	....	....	
20,000	20,000	.000550	.000150	....	....	
25,000	25,000	.000750	.000200	....	....	
30,000	30,000	.000875	.000125	0.	....	
35,000	35,000	.001050	.000175	....	....	
40,000	40,000	.001225	.000175	....	....	
45,000	45,000	.001400	.000175	....	....	
50,000	50,000	.001600	.000200	0.	....	
51,000	51,000	.001625	.000025	....	....	Elastic limit.
52,000	52,000	.001750	.000125	....	....	
53,000	53,000	.002125	.000375	....	....	
54,000	54,000	.003325	.001200	....	....	
55,000	55,000	.004200	.000875	....	....	
56,000	56,000	.004975	.000775	....	....	
58,000	58,000	.006500	.001525	....	....	
60,000	60,000	.007775	.001275	....	....	
62,000	62,000	.009175	.001400	....	....	
64,000	64,000	.010500	.001325	....	....	
66,000	66,000	.011750	.001250	....	....	
68,000	68,000	.013300	.001550	....	....	
70,000	70,000	.014875	.001575	....	....	
72,000	72,000	.016250	.001375	....	....	
74,000	74,000	.017900	.001650	....	....	
76,000	76,000	.019150	.001250	....	....	
78,000	78,000	.020925	.001775	....	....	
80,000	80,000	.022900	.001975	....	....	
111,550	111,550	....	....	....	....	Ultimate strength.

Failed by triple flexure.

8-INCH STEEL B. L. RIFLES.

SPECIFIC GRAVITY AND HARDNESS OF TUBES AND JACKETS.

No tension tests of these specimens.

Number of rifle.	Position in rifle.	Marks on specimen.	Specific gravity.	Hardness.
10	Tube	8 R_{10} T—B R_{11} M	7.8519	17.90
22	....do	8 R_{22} T—B R_8 M	7.8545	20.25
23	....do	8 R_{23} T—B R_5 M	7.8564	17.17
24	....do	8 R_{24} T—B R_5 M	7.8582	18.29
21	Jacket	8 R_{21} J—B R_{14} M	7.8558	20.81
22	....do	8 R_{22} J—B R_6 M	7.8574	19.60
23	....do	8 R_{23} J—B R_{19} M	7.8570	20.70

8-INCH STEEL B. L. RIFLES.

CHEMICAL COMPOSITION OF TUBES NOS. 22 AND 23, AND JACKET NO. 22.

Compression test number.	Number of rifle.	Position in rifle.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.
			Total.	Graphitic.	Combined.				
956	22	Tube	0.230	0.010	0.220	0.662	0.149	0.030	0.024
957	23	....do	0.233	0.009	0.233	0.662	0.157	0.024	0.020
960	22	Jacket	0.292	0.027	0.265	0.640	0.109	0.023	0.025

TABULATION OF TENSION SPECIMENS FROM 8-INCH STEEL B. L. RIFLES.

[Stems 3 inches long, ''.564 diameter.]

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per ct.*	*Per ct.*	
4721	Jacket No. 9	Outside	50,000	92,320	19.3	33.5	Silky.*
4722	....do	....do	50,000	84,680	23.3	47.2	Do.†

* Breech end. † Muzzle end.

TABULATION OF COMPRESSION SPECIMENS FROM 8-INCH STEEL B. L. RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.
			Pounds.	*Pounds.*	
973	Tube No. 10	Middle	48,000	98,430	Triple flexure.*
956	Tube No. 22	....do	49,000	107,720	Do.*
957	Tube No. 23	....do	49,000	100,570	Do.*
958	Tube No. 24	....do	47,000	103,100	Do.*
959	Jacket No. 21	....do	51,000	110,300	Do.*
960	Jacket No. 22	....do	51,000	109,980	Do.*
961	Jacket No. 23	....do	51,000	111,550	Do.*

* Breech end.

10-INCH STEEL B. L. RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE NO. 4.

No. 4534.

Marks, $^{10\ R,\ T}_{B\ T,\ M}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000100	.000100	0.	....	
2, 500	10, 000	.000300	.000200	....	....	
5, 000	20, 000	.000633	.000333	....	....	
7, 500	30, 000	.001000	.000367	....	....	
8, 750	35, 000	.001133	.000133	0.	....	
10, 000	40, 000	.001333	.000200	.000033	.000033	
10. 250	41, 000	.001367	.000034	....	....	
10, 500	42, 000	.001400	.000033	....	....	
10, 750	43, 000	.001433	.000033	....	....	
11, 000	44, 000	.001467	.000034	....	....	
11, 250	45, 000	.001500	.000033	....	....	
11. 500	46, 000	.001533	.000033	....	....	
11, 750	47, 000	.001600	.000067	....	....	
12, 000	48, 000	.001667	.000067	....	....	Elastic limit.
12, 250	49, 000	.002067	.000400	....	....	
12, 500	50, 000	.002733	.000666	....	....	
12, 750	51, 000	.003233	.000500	....	....	
13, 000	52, 000	.004000	.000767	....	....	
13, 250	53, 000	.005033	.001033	....	....	
23, 750	95, 000	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95, 000
Elastic limit per square inch of original section	do...	48, 000
Elongation per inch after rupture	inch..	.1967
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33. 5
Position of rupture		1″.10 from neck
Character of broken surface		granular, 75 per cent; silky, 25 per cent
Elongation of inch sections		″.27*, ″.20, ″.12

No. 990.

Marks, $\begin{smallmatrix}10\ R,\ T\\ B\ T,\ M\end{smallmatrix}$
Length, 5''.
Diameter, 1''.127.
Sectional area, 1 square inch.
Gauged length, 4''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	1, 000	0.	0.	0.	0.	Initial load.
5, 000	5, 000	.000100	.000100			
10, 000	10, 000	.000250	.000150			
15, 000	15, 000	.000425	.000175			
20, 000	20, 000	.000625	.000200			
25, 000	25, 000	.000775	.000150			
30, 000	30, 000	.000925	.000150			
35, 000	35, 000	.001100	.000175	0.		
40, 000	40, 000	.001250	.000150	0.		
41, 000	41, 000	.001300	.000050			
42, 000	42, 000	.001325	.000025			
43, 000	43, 000	.001350	.000025			
44, 000	44, 000	.001375	.000025			
45, 000	45, 000	.001425	.000050			
46, 000	46, 000	.001450	.000025			
47, 000	47, 000	.001500	.000050			
48, 000	48, 000	.001550	.000050			
49, 000	49, 000	.001600	.000050			
50. 000	50, 000	.001650	.000050	.000025	.000025	Elastic limit.
51. 000	51, 000	.001975	.000325			
52, 000	52, 000	.002450	.000475			
53, 000	53, 000	.003125	.000675			
54, 000	54, 000	.003650	.000525			
56, 000	56, 000	.005300	.001650			
58, 000	58, 000	.006825	.001525			
60, 000	60, 000	.008400	.001575	.006125	.006100	
62, 000	62, 000	.009525	.001125			
64, 000	64, 000	.010950	.001425			
66, 000	66, 000	.012800	.001850			
68, 000	68, 000	.014275	.001475			
70, 000	70, 000	.015875	.001600	.013150	.007025	
102, 200	102, 200					Ultimate strength.

Failed by doube flexure.

No. 4533.

Marks, $^{10\ \mathrm{R.\,T}}_{\mathrm{M\ T.\,M}}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	.0	.0	.0	.0	Initial load.
1,250	5,000	.000100	.000100	.0	....	
2,500	10,000	.000267	.000167	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001100	.000167	....	....	
10,000	40,000	.001267	.000167	.0	....	
10,250	41,000	.001300	.000033	.0	....	
10,500	42,000	.001333	.000033	....	....	
10,750	43,000	.001367	.000034	....	....	
11,000	44,000	.001400	.000033	....	....	
11,250	45,000	.001433	.000033	....	....	
11,500	46,000	.001500	.000067	....	....	
11,750	47,000	.001533	.000033	....	....	
12,000	48,000	.001600	.000067	....	....	Elastic limit.
12,250	49,000	.003667	.002067	....	....	
12,500	50,000	.005167	.001500	....	....	
12,750	51,000	.005667	.000500	....	....	
13,000	52,000	.006600	.000933	....	....	
13,250	53,000	.007400	.000800	....	....	
23,210	92,840	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92.840
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.1867
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.135
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″.5 from the neck
Character of broken surface		silky
Elongation of inch sections		″.13, ″.21*, ″.12

TUBE No. 5.

No. 991.

Marks, $^{10\ R_6\ T.}_{B\ T_4\ M.}$
Length, 5''.
Diameter, 1''.126.
Sectional area, .0996 square inch.
Gauged length, 4''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
996	1,000	0.	0.	.0	0.	Initial load.
4,980	5,000	.000100	.000100	.0	....	
9,960	10,000	.000200	.000100	....	....	
14,940	15,000	.000350	.000150	....	....	
19,920	20,000	.000500	.000150	....	....	
24,900	25,000	.000650	.000150	....	....	
29,880	30,000	.000800	.000150	....	....	
34,860	35,000	.000975	.000175	....	....	
39,840	40,000	.001200	.000225	.000075	.000075	
40,836	41,000	.001250	.000050	....	....	
41,832	42,000	.001300	.000050	....	....	
42,828	43,000	.001375	.000075	....	....	Elastic limit.
43,824	44,000	.001475	.000100	....	....	
44,820	45,000	.001675	.000200	....	....	
45,816	46,000	.002175	.000500	....	....	
46,812	47,000	.003350	.001175	....	....	
47,808	48,000	.004475	.001125	....	....	
48,804	49,000	.005250	.000775	....	....	
49,800	50,000	.006150	.000900	.004500	.004425	
51,792	52,000	.007625	.001475	....	....	
53,784	54,000	.009025	.001400	....	....	
55,776	56,000	.010700	.001675	....	....	
57,768	58,000	.012475	.001775	....	....	
59,760	60,000	.014025	.001550	.012000	.007500	
61,752	62,000	.015700	.001675	....	....	
63,744	64,000	.017450	.001750	....	....	
65,736	66,000	.019625	.002175	....	....	
67,728	68,000	.021750	.002125	....	....	
69,720	70,000	.023525	.001775	.021125	.009125	
94,850	95,230	....	....	....	....	Ultimate strength.

Failed by double flexture.

TUBE No. 6.

No. 974.

Marks, $^{10\ R.\ T}_{B\ T_4\ M}$
Length, 5″.
Diameter, 1″.127.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	1, 000	0.	0.	0.	0.	Initial load.
5, 000	5, 000	.000125	.000125	0.	....	
10, 000	10, 000	.000250	.000125	....	....	
15, 000	15, 000	.000400	.000150	....	....	
20, 000	20, 000	.000550	.000150	....	....	
25, 000	25, 000	.000725	.000175	....	....	
30, 000	30, 000	.000900	.000175	....	....	
35, 000	35, 000	.001075	.000175	0.	....	
40, 000	40, 000	.001275	.000200	.000025	.000025	
41, 000	41, 000	.001300	.000025	....	....	
42, 000	42, 000	.001325	.000025	....	....	
43, 000	43, 000	.001375	.000050	....	....	
44, 000	44, 000	.001400	.000025	....	....	
45, 000	45, 000	.001425	.000025	.000025	0.	
46, 000	46, 000	.001475	.000050	....	....	
47, 000	47, 000	.001500	.000025	....	....	
48, 000	48, 000	.001550	.000050	....	....	
49, 000	49, 900	.001575	.000025	....	....	
50, 000	50, 000	.001625	.000050	.000050	.000025	Elastic limit.
51, 000	51, 000	.003000	.001375	....	....	
52, 000	52, 000	.003875	.000875	....	....	
53, 000	53, 000	.004550	.000675	....	....	
54, 000	54, 000	.005175	.000625	....	....	
56, 000	56, 000	.006575	.001400	....	....	
58, 000	58, 000	.008250	.001675	....	....	
60, 000	60, 000	.009700	.001450	....	....	
62, 000	62, 000	.011200	.001500	....	....	
64, 000	64, 000	.012500	.001300	....	....	
66, 000	66, 000	.014000	.001500	....	....	
68, 000	68, 000	.015825	.001825	....	....	
70, 000	70, 000	.017550	.001725	....	....	
108, 400	108, 400	....	....	....	....	Ultimate strength.

Failed by triple flexure.

TUBE NO. 7.

No. 4583

Marks, ${}^{10\ \mathrm{R,\,T}}_{\mathrm{BT,\,M}}$
Diameter, ″.566.
Sectional area, .252 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
252	1,000	0.	0.	0.	0.	Initial load.
1,260	5,000	.000067	.000067	0.	....	
2,520	10,000	.000267	.000200	....	....	
5,040	20,000	.000567	.000300	....	....	
7,560	30,000	.000900	.000333	....	....	
8,820	35,000	.001067	.000167	0.	....	
10,080	40,000	.001233	.000166	0.	....	
10,332	41,000	.001267	.000034	....	....	
10,584	42,000	.001300	.000033	....	....	
10,836	43,000	.001333	.000033	....	....	
11,088	44,000	.001367	.000084	....	....	
11,340	45,000	.001400	.000033	....	....	
11,592	46,000	.001433	.000033	....	....	
11,844	47,000	.001467	.000034	....	....	Elastic limit.
12,096	48,000	.001567	.000100	....	....	
12,348	49,000	.002400	.000833	....	....	
12,600	50,000	.003933	.001533	....	....	
12,852	51,000	.004533	.000600	....	....	
13,104	52,000	.005933	.001400	....	....	
23,220	92,140	....	....	....	....	Tensile strength..

General summary.

Tensile strength per square inch of original section	pounds..	92,140
Elastic limit per square inch of original section	do..	47,000
Elongation per inch after rupture	inch..	.2267
Elongation per inch under strain at elastic limit	do..	.001467
Reduction in diameter at point of rupture	do..	.146
Reduction in area after rupture, per cent of original section		45.0
Position of rupture		1″.6 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.38*, ″.16

No. 999.

Marks, $\substack{10\ R,\ T\\ B\ T,\ M}$

Length, 5″.

Diameter, 1″.126.

Sectional area, 1 square inch.

Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	.0	.0	Initial load.
5,000	5,000	.000100	.000100	....	....	
10,000	10,000	.000250	.000150	....	....	
15,000	15.000	.000375	.000125	....	....	
20,000	20,000	.000525	.000150	....	....	
25,000	25,000	.000675	.000150	....	....	
30,000	30,000	.000825	.000150	....	....	
35,000	35,000	.000975	.000150	....	....	
40,000	40,000	.001150	.000175	.000025	.000025	
41,000	41,000	.001200	.000050	....	....	
42,000	42,000	.001250	.000050	....	....	
43,000	43,000	.001275	.000025	....	....	
44.000	44,000	.001300	.000025	....	....	
45,000	45,000	.001325	.000025	....	....	
46,000	46,000	.001400	.000075	....	....	
47.000	47,000	.001450	.000050	....	....	
48,000	48,000	.001500	.000050	....	....	Elastic limit.
49,000	49,000	.001625	.000125	....	....	
50,000	50,000	.002325	.000700	....	....	
51,000	51,000	.004050	.001725	....	....	
52,000	52,000	.004875	.000825	....	....	
54,000	54,000	.006625	.001750	....	....	
56,000	56,000	.008275	.001650	....	....	
58,000	58,000	.009750	.001475	....	....	
60,000	60,000	.011400	.001650	....	....	
62,000	62,000	.013050	.001650	....	....	
64,000	64,000	.014675	.001625	....	....	
66,000	66,000	.016200	.001525	....	....	
68,000	68,000	.018125	.001925	....	....	
70,000	70,000	.019875	.001750	....	....	
102,860	102,860	....	....	....	....	Ultimate strength.

Failed by triple flexure.

Hx. Ex. 43——5

No. 4582.

Marks, $\substack{10\ R,\ T \\ M\ T,\ M}$
Diameter, ″.565.
Sectional area, .251 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
251	1,000	0.	0.	0.	0.	
1,255	5,000	.000067	.000067	0.	....	Initial load.
2,510	10,000	.000267	.000200	....	....	
5,020	20,000	.000633	.000366	....	....	
7,530	30,000	.000967	.000334	....	....	
8,785	35,000	.001100	.000133	0,	....	
10,040	40,000	.001300	.000200	0.	....	
10,291	41,000	.001333	.006033	....	....	
10,542	42,000	.001367	.000034	....	....	
10,793	43,000	.001400	.000033	....	....	
11,044	44,000	.001433	.000033	....	....	Elastic limit.
11,295	45,000	.001733	.000300	....	....	
11,546	46,000	.002067	.000334	....	....	
11,797	47,000	.002333	,000266	....	....	
12,048	48,000	.005267	.002934	....	....	
12,299	49,000	.006567	.001300	....	....	
22,430	89,360	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,360
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	.2233
Elongation per inch under strain at elastic limit	do...	.001433
Reduction in diameter at point of rupture	do...	.155
Reduction in area after rupture, per cent of original section		47.4
Position of rupture		″.9 from neck
Character of broken surface		silky
Elongation of inch section		″.12, ″.16, ″.39*

TUBE NO. 8.

No. 1000.

Marks, $^{10\ R,\ T}_{B\ T_4\ M}$
Length, 5″.
Diameter, 1″.128.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000125	.000125	....	....	
10,000	10,000	.000250	.000150	....	....	
15,000	15,000	.000375	.000125	....	....	
20,000	20,000	.000525	.000150	....	....	
25,000	25,000	.000675	.000150	....	....	
30,000	30,000	.000875	.000200	....	....	
35,000	35,000	.001000	.000125	....	....	
40,000	40,000	.001150	.000150	.000025	.000015	
41,000	41,000	.001175	.000025	....	....	
42,000	42,000	.001225	.000050	....	....	
43,000	43,000	.001250	.000025	....	....	
44,000	44,000	.001275	.000025	....	....	
45,000	45,000	.001300	.000025	....	....	
46,000	46,000	.001325	.000025	....	....	
47,000	47,000	.001375	.000050	....	....	
48,000	48,000	.001425	.000050	....	....	
49,000	49,000	.001475	.000050	....	....	Elastic limit.
50,000	50,000	.001650	.000175	....	....	
51,000	51,000	.002125	.000475	....	....	
52,000	52,000	.003225	.001100	....	....	
54,000	54,000	.004950	.001725	....	....	
56,000	56,000	.006300	.001350	....	....	
58,000	58,000	.007750	.001450	....	....	
60,000	60,000	.009000	.001250	....	....	
62,000	62,000	.010575	.001575	....	....	
64,000	64,000	.012200	.001625	....	....	
66,000	66,000	.013500	.001300	....	....	
68,000	68,000	.014950	.001450	....	....	
70,000	70,000	.016525	.001575	....	....	
106,400	106,400	....	....	....	....	Ultimate strength.

Failed by triple flexure.

TUBE NO. 10.

No. 4609.

Marks, 10 R., T B T, M
Diameter, ".563.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000633	.000300	....	....	
7,500	30,000	.001000	.000367	....	....	
8,750	35,000	.001133	.000133	.000033	.000033	
10,000	40,000	.001400	.000267	.000067	.000034	
10,250	41,000	.001433	.000033	....	....	
10,500	42,000	.001500	.000067	....	....	
10,750	43,000	.001533	.000033	....	....	
11,000	44,000	.001567	.000034	....	....	
11,250	45,000	.001633	.000066	....	....	
11,500	46,000	.001667	.000034	....	....	
11,750	47,000	.001700	.000033	....	....	
12,000	48,000	.001767	.000067	....	....	Elastic limit.
12,250	49,000	.003067	.001900	....	....	
12,500	50,000	.004667	.001000	....	....	
12,750	51,000	.005067	.000400	....	....	
13,000	52,000	.006233	.001167	....	....	
13,250	53,000	.007200	.000967	....	....	
22,980	91,920	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section .... pounds.. 91,920
Elastic limit per square inch of original section .... do... 48,000
Elongation per inch after rupture .... inch.. .2167
Elongation per inch under strain at elastic limit .... do... .001767
Reduction in diameter at point of rupture .... do... .133
Reduction in area after rupture, per cent of original section 41.9
Position of rupture .... at middle of stem
Character of broken surface .... silky, serrated
Elongation of inch sections .... ".18, ".36, ".11

No. 4608.

Marks, $^{10\,\mathrm{R,T}}_{\mathrm{MT,M}}$
Diameter, ″.563.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000233	.000166	....	....	
5,000	20,000	.000600	.000367	....	....	
7,500	30,000	.000900	.000300	....	....	
8,750	35,000	.001100	.000200	0.	....	
10,000	40,000	.001267	.000167	0.	....	
10,250	41,000	.001300	.000033	....	....	
10,500	42,000	.001333	.000033	....	....	
10,750	43,000	.001367	.000034	....	....	
11,000	44,000	.001433	.000066	....	....	
11,250	45,000	.001467	.000034	....	....	
11,500	46,000	.001500	.000033	....	....	
11,750	47,000	.001533	.000033	....	....	
12,000	48,000	.001567	.000034	....	....	
12,250	49,000	.001600	.000034	....	....	
12,500	50,000	.001633	.000033	....	....	Elastic limit.
12,750	51,000	.005333	.003700	....	....	
13,000	52,000	.006333	.001000	....	....	
13,250	53,000	.007167	.000834	....	....	
13,500	54,000	.008267	.001100	....	....	
13,750	55,000	.009167	.000900	....	....	
22,490	89,960	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section....pounds..	89,960
Elastic limit per square inch of original section....do ..	50,000
Elongation per inch after rupture....inch..	.210
Elongation per inch under strain at elastic limit....do...	.001633
Reduction in diameter at point of rupture....do...	.123
Reduction in area after rupture, per cent of original section....	39.2
Position of rupture....	1″ from neck
Character of broken fracture....	granular, 60 per cent; silky, 40 per cent
Elongation of inch sections....	″.13, ″18, ″32

TUBE No. 16.

No. 4680.

Marks, $\genfrac{}{}{0pt}{}{10\ R\ {}_{16}\ T}{B\ T\ ,\ M}$
Diameter ″.564.
Sectional area .25 square inch.
Gauged, length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanant set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000067	.000067	0.	....	
2, 500	10, 000	.000300	.000233	....	....	
5, 000	20. 000	.000633	.000333	....	....	
7, 500	30, 000	.000967	.000334	....	....	
8. 750	35, 000	.001100	.000133	0.	....	
10, 000	40, 000	.001333	.000233	0.	....	
10, 250	41, 000	.001333	0.	....	....	
10, 500	42, 000	.001367	.000034	....	....	
10, 750	43, 000	.001400	.000033	....	....	
11, 000	44, 000	.001433	.000033	....	....	
11, 250	45, 000	.001500	.000067	....	....	Elastic limit.
11, 500	46, 000	.005000	.003500	....	....	
11, 750	47, 000	.006667	.001667	....	....	
12, 000	48, 000	.007333	.000666	....	....	
12, 250	49, 000	.008333	.001000	....	....	
12, 500	50, 000	.009333	.001000	....	....	
21, 310	85, 240	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85, 240
Elastic limit per square inch of original section	do...	45, 000
Elongation per inch after rupture	inches..	.2433
Elongation per inch under strain at elastic limit	do...	.001500
Deduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52. 2
Position of rupture		1″.5 from neck.
Character of broken surface		silky
Elongation of inch sections		″.13, ″.39*, ″.21

No. 4679.

Marks, $^{10\ R_{16}\ T}_{M\ T_3\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10.000	.000333	.000233	....	....	
5,000	20.000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	....	....	
8,750	35,000	.001167	.000167	0.	....	
10,000	40,000	.001333	.000166	0.	....	
10,250	41,000	.001367	.000034	....	....	
10,500	42,000	.001400	.000033	....	....	
10,750	43,000	.001433	.000033	....	....	
11,000	44,000	.001467	.000034	....	....	
11,250	45,000	.001533	.000066	....	....	
11,500	46,000	.001600	.000067	....	....	
11,750	47,000	.001667	.000067	....	....	
12,000	48,000	.001700	.000033	....	....	
12,250	49,000	.001733	.000033	....	....	Elastic limit.
12,500	50,000	.004000	.002267	....	....	
12,750	51,000	.007300	.003300	....	....	
13,000	52,000	.007833	.000533	....	....	
13,250	53,000	.008333	.000500	....	....	
13,500	54,000	.009333	.001000	....	....	
22,710	90,840	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	90,840
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch	.2100
Elongation per inch under strain at elastic limit	do	.001733
Reduction in diameter at point of rupture	do	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1".15 from neck
Character of broken surface		silky
Elongation of inch sections		".12, ".19, ".32

JACKET NO. 3.

No. 4513.

Marks, $\genfrac{}{}{0pt}{}{10\ R_3\ J}{B\ T_2\ M}$
Diameter, ''.565.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000267	.000200	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001067	.000134	0.	....	
10,000	40,000	.001267	.000200	....	....	
10,500	42,000	.001300	.000033	0.	....	
10,750	43,000	.001333	.000033	....	....	
11,000	44,000	.001367	.000034	....	....	
11,250	45,000	.001400	.000033	....	....	
11,500	46,000	.001433	.000033	....	....	
11,750	47,000	.001433	0.	....	....	
12,000	48,000	.001500	.000067	....	....	
12,250	49,000	.001533	.000033	....	....	
12,500	50,000	.001567	.000034	....	....	
12,750	51,000	.001600	.000033	....	....	
13,000	52,000	.001633	.000033	....	....	
13,250	53,000	.001700	.000067	....	....	
13,500	54,000	.001733	.000033	....	....	Elastic limit.
13,750	55,000	.002000	.000267	....	....	
14,000	56,000	.003167	.001167	....	....	
14,250	57,000	.003600	.000433	....	....	
14,500	58,000	.004600	.001000	....	....	
14,750	59,000	.004933	.000333	....	....	
26,310	105,240	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	105.240
Elastic limit per square inch of original section	do	54,000
Elongation per inch after rupture	inch	.1600
Elongation per inch under strain at elastic limit	do	.001733
Reduction in diameter at point of rupture	do	.065
Reduction in area after rupture, per cent of original section		21.4
Position of rupture		1''.6 from neck
Character of broken surface		granular, radiating from a point in the circumference
Elongation of inch sections		''.12, ''.22*, ''.14

No. 975.

Marks, $^{10\ R.\ J.}_{B\ T.\ M.}$
Length, 5″.
Diameter, 1″.103.
Sectional area, .956 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
956	1, 000	0.	0.	0.	0.	
4, 780	5, 000	.000100	.000100	0.	....	
9, 560	10, 000	.000200	.000100	....	....	
14, 340	15, 000	.000375	.000175	....	....	
19, 120	20, 000	.090525	.000150	....	....	
23, 900	25, 000	.000700	.000175	....	....	
28, 680	30, 000	.000875	.000175	....	....	
33, 460	35, 000	.001000	.000125	....	....	
38, 240	40, 000	.001200	.000200	—.000025	—.000025	
43, 020	45, 000	.001325	.000125	0.	+.000025	
43, 976	46, 000	.001375	.000050	....	....	
44, 932	47, 000	.001425	.000050	....	....	
45, 888	48, 000	.001450	.000025	....	....	
46, 844	49, 000	.001475	.000025	....	....	
47, 800	50, 000	.001500	.000025	0.	....	
48, 756	51, 000	.001525	.000025	....	....	
49, 712	52, 000	.001575	.000050	....	....	
50, 668	53, 000	.001625	.000050	....	....	Elastic limit.
51, 624	54, 000	.005625	.004000	....	....	
52, 580	55, 000	.006175	.000550	....	....	
53, 536	56, 000	.006650	.000475	....	....	
55, 448	58, 000	.007950	.001300	....	....	
57, 360	60, 000	.009350	.001400	....	....	
59, 272	62, 000	.010600	.001250	....	....	
61, 184	64, 000	.012025	.001425	....	....	
63, 096	66, 000	.013450	.001425	....	....	
65, 008	68, 000	.014900	.001450	....	....	
66, 920	70, 000	.016450	.001550	....	....	
105, 100	109, 940	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 4512.

Marks, $\substack{10\ E,\ J \\ M\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000067	.000067	0.		
2, 500	10, 000	.000267	.000200			
5, 000	20, 000	.000600	.000333			
7, 500	30, 000	.000933	.000333			
8, 750	35, 000	.001067	.000134			
10, 000	40, 000	.001267	.000200			
10, 500	42, 000	.001333	.000066	0.		
10, 750	43, 000	.001367	.000034			
11, 000	44, 000	.001400	.000033			
11, 250	45, 000	.001433	.000033			
11, 500	46, 000	.001467	.000034			
11, 750	47, 000	.001500	.000033			
12, 000	48, 000	.001533	.000033			
12, 250	49, 000	.001600	.000067			
12, 500	50, 000	.001633	.000033			
12, 750	51, 000	.001667	.000034			
13, 000	52, 000	.001700	.000033			
13, 250	53, 000	.001733	.000033			
13, 500	54, 000	.001800	.000067			Elastic limit.
13, 750	55, 000	.001967	.000167			
14, 000	56, 000	.002533	.000566			
14, 250	57, 000	.003333	.000800			
14, 500	58, 000	.004000	.000667			
14, 750	59, 000	.004667	.000667			
25, 620	102, 480					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	102, 480
Elastic limit per square inch of original section	do	54, 000
Elongation per inch after rupture	inch	.1900
Elongation per inch under strain at elastic limit	do	.001800
Reduction in diameter at point of rupture	do	.094
Reduction in area after rupture, per cent of original section		30. 6
Position of rupture		″.75 from neck
Character of broken surface		granular 70 per cent, silky 30 per cent
Elongation of inch sections		″.28*, ″.18, ″.11

JACKET NO. 4.

No. 4526.

Marks, $^{10\,R_4\,J}_{B\,T_2\,M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000300	.000200	....	....	
5,000	20,000	.000600	.000300	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001100	.000167	0.	....	
10,000	40,000	.001267	.000167	....	....	
10,500	42,000	.001333	.000066	0.	....	
10,750	43,000	.001367	.000034	....	....	
11,000	44,000	.001400	.000033	....	....	
11,250	45,000	.001433	.000033	....	....	
11,500	46,000	.001467	.000034	....	....	
11,750	47,000	.001533	.000066	....	....	
12,000	48,000	.001600	.000067	....	....	
12,250	49,000	.001633	.000033	....	....	Elastic limit.
12,500	50,000	.008833	.007200	....	....	
12,750	51,000	.009200	.000367	....	....	
13,000	52,000	.010000	.000800	....	....	
13,250	53,000	.010933	.000933	....	....	
13,500	54,000	.012267	.001334	....	....	
22,030	88,120	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,120
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.220
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1".3 from neck
Character of broken surface		silky
Elongation of inch sections		".12, ".27*, ".27*

No. 976.

Marks, $^{10\ R,\ J}_{B\ T,\ M}$
Length, 5″.
Diameter, 1″.109.
Sectional area, .966 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
966	1, 000	0.	0.	0.	0.	Initial load.
4, 830	5, 000	.000100	.000100	0.	....	
9, 660	10, 000	.000225	.000125	....	....	
14, 490	15, 000	.000375	.000150	....	....	
19, 320	20, 000	.000500	.000125	....	....	
24, 150	25, 000	.000675	.000175	....	....	
28, 980	30, 000	.000800	.000125	....	....	
33, 810	35, 000	.001000	.000200	....	....	
38, 640	40, 000	.001150	.000150	0.	....	
43, 470	45, 000	.001400	.000250	0.	....	
44, 436	46, 000	.001450	.000050	....	....	
45, 402	47, 000	.001500	.000050	....	....	
46, 368	48, 000	.001550	.000050	....	....	Elastic limit.
47, 334	49, 000	.006550	.005000	....	....	
48, 300	50, 000	.007100	.000550	....	....	
50, 232	52, 000	.008375	.001275	....	....	
52. 164	54, 000	.009700	.001325	....	....	
54, 096	56, 000	.011275	.001575	....	....	
56, 028	58, 000	.012825	.001550	....	....	
57, 960	60, 000	.014350	.001525	....	....	
59. 892	62, 000	.016050	.001700	....	....	
61, 824	64, 000	.017625	.001575	....	....	
63, 756	66, 000	.019250	.001625	....	....	
65, 688	68, 000	.021500	.002250	....	....	
67, 620	70, 000	.023675	.002175	....	....	
94, 200	97, 520	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 4525.

Marks, $^{10\ R,\ J}_{M\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	...	...	
2,500	10,000	.000267	.000167	...	...	
5,000	20,000	.000633	.000366	...	...	
7,500	30,000	.000967	.000334	...	...	
8,750	35,000	.001133	.000166	.000033	.000033	
10,000	40,000	.001300	.000167	...	...	
10,500	42,000	.001367	.000067	.000033	0.	
10,750	43,000	.001400	.000033	...	...	
11,000	44,000	.001433	.000033	...	...	
11,250	45,000	.001467	.000034	...	...	
11,500	46,000	.001533	.000066	...	...	
11,750	47,000	.001567	.000034	...	...	
12,000	48,000	.001600	.000033	...	...	
12,250	49,000	.001667	.000067	...	...	
12,500	50,000	.001700	.000033	...	...	
12,750	51,000	.001767	.000067	...	...	Elastic limit.
13,000	52,000	.002467	.000700	...	...	
13,250	53,000	.003000	.000533	...	...	
13,500	54,000	,004000	001000	...	...	
13,750	55,000	,004633	.000633	...	...	
14,000	56,000	.006000	.001367	...	...	
24,260	97,040	...	...	...	...	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	97,040
Elastic limit per square inch of original section	do	51,000
Elongation per inch after rupture	inch	.1900
Elongation per inch under strain at elastic limit	do	.001767
Reduction in diameter at point of rupture	do	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		″1.21 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.24*, ″.21*

Tube No. 10.

No. 4609.

Marks, $\frac{10\ R_{10}\ T}{B\ T_3\ M}$
Diameter, ″.563.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000633	.000300	....	....	
7,500	30,000	.001000	.000367	....	....	
8,750	35,000	.001133	.000133	.000033	.000033	
10,000	40,000	.001400	.000267	.000067	.000034	
10,250	41,000	.001433	.000033	....	....	
10,500	42,000	.001500	.000067	....	....	
10,750	43,000	.001533	.000033	....	....	
11,000	44,000	.001567	.000034	....	....	
11,250	45,000	.001633	.000066	....	....	
11,500	46,000	.001667	.000034	....	....	
11,750	47,000	.001700	.000033	....	....	
12,000	48,000	.001767	.000067	....	....	Elastic limit.
12,250	49,000	.003667	.001900	....	....	
12,500	50,000	.004667	.001000	....	....	
12,750	51,000	.005067	.000400	....	....	
13,000	52,000	.006233	.001167	....	....	
13,250	53,000	.007200	.000967	....	....	
22,980	91,920	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,920
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2167
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.133
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		at middle of stem
Character of broken surface		silky, serrated
Elongation of inch sections		″.18, ″.36*, ″11

No. 4608.

Marks, $^{10\,R,\,T}_{MT,\,M}$
Diameter, ″.563.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000067	.000067	0.		
2, 500	10, 000	.000233	.000166			
5, 000	20, 000	.000600	.000367			
7, 500	30, 000	.000900	.000300			
8, 750	35, 000	.001100	.000200	0.		
10, 000	40, 000	.001267	.000167	0.		
10, 250	41, 000	.001300	.000033			
10, 500	42, 000	.001333	.000033			
10, 750	43, 000	.001367	.000034			
11, 000	44, 000	.001433	.000066			
11, 250	45, 000	.001467	.000034			
11, 500	46, 000	.001500	.000033			
11, 750	47, 000	.001533	.000033			
12, 000	48, 000	.001567	.000034			
12, 250	49, 000	.001600	.000034			
12, 500	50, 000	.001633	.000033			Elastic limit.
12, 750	51, 000	.005333	.003700			
13, 000	52, 000	.006333	.001000			
13, 250	53, 000	.007167	.000834			
13, 500	54, 000	.008267	.001100			
13, 750	55, 000	.009167	.000900			
22, 490	89, 960					Tensile strength.

General summary.

Tensile strength per square inch of original section .... pounds..	89, 960
Elastic limit per square inch of original section .... do ..	50, 000
Elongation per inch after rupture .... inch..	.210
Elongation per inch under strain at elastic limit .... do...	.001633
Reduction in diameter at point of rupture .... do...	.123
Reduction in area after rupture, per cent of original section	39. 2
Position of rupture	1″ from neck
Character of broken fracture	granular, 60 per cent; silky, 40 per cent
Elongation of inch sections	″.13, ″.18, ″.32

TUBE NO. 15.

No. 4617.

Marks, $\overset{10\ R_{15}\ T}{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000167	.000167	0.	....	
2,500	10,000	.000400	.000233	....	....	
5,000	20,000	.000700	.000300	....	....	
7,500	30,000	.001067	.000367	....	....	
8,750	35,000	.001233	.000166	.000033	.000033	
10,000	40,000	.001400	.000167	.000033	0.	
10,250	41,000	.001433	.000033	....	....	
10,500	42,000	.061467	.000034	....	....	
10,750	43,000	.001500	.000033	....	....	
11,000	44,000	.001567	.000067	....	....	
11,250	45,000	.001600	.000033	....	....	
11,500	46,000	.001633	.000033	....	....	
11,750	47,000	.001667	.000034	....	....	
12,000	48,000	.001733	.000066	....	....	Elastic limit.
12,250	49,000	.001833	.000100	....	....	
12,500	50,000	.002167	.000334	....	....	
12,750	51,000	.003267	.001100	....	....	
13,000	52,000	.004133	.000866	....	....	
13,250	53,000	.005067	.000934	....	....	
24,140	96,560	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,560
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.1867
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per cent of original section		36.4
Position of rupture		at middle of stem
Character of broken surface		silky, serrated
Elongation of inch sections		″.13, ″.31*, ″.12

No. 4616.

Marks, $\substack{10\ R_{15}\ T \\ M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000333	.000200			
5,000	20,000	.000667	.000334			
7,500	30,000	.000967	.000300			
8,750	35,000	.001200	.000233	0.		
10,000	40,000	.001367	.000167	0.		
10,250	41,000	.001433	.000066			
10,500	42,000	.001500	.000067			
10,750	43,000	.001533	.000033			
11,000	44,000	.001567	.000034			
11,250	45,000	.001600	.000033			
11,500	46,000	.001667	.000067			Elastic limit.
11,750	47,000	.001900	.000233			
12,000	48,000	.002300	.000400			
12,250	49,000	.003167	.000867			
12,500	50,000	.004500	.001333			
12,750	51,000	.005667	.001167			
23,110	92,440					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,440
Elastic limit per square inch of original section	do...	46,000
Elongation per inch after rupture	inch..	.1333
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per cent of original section		15.0
Position of rupture		″.7 from neck
Character of broken surface		granular, flaky spot at circumference
Elongation of inch sections		″.10, ″.12, ″.18*

TUBE No. 16.

No. 4680.

Marks, $\begin{matrix}10\,\text{R}_{16}\,\text{T}\\ \text{B T , M}\end{matrix}$
Diameter ″.564.
Sectional area .25 square inch.
Gauged, length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanant set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000300	.000233	....	....	
5,000	20.000	.000633	.000333	....	....	
7,500	30,000	.000967	.000334	....	....	
8.750	35,000	.001100	.000133	0.	....	
10,000	40,000	.001333	.000233	0.	....	
10,250	41,000	.001333	0.	....	....	
10,500	42,000	.001367	.000034	....	....	
10,750	43,000	.001400	.000033	....	....	
11,000	44,000	.001433	.000033	....	....	
11,250	45,000	.001500	.000067	....	....	Elastic limit.
11,500	46,000	.005000	.003500	....	....	
11,750	47,000	.006667	.001667	....	....	
12,000	48,000	.007333	.000666	....	....	
12,250	49,000	.008333	.001000	....	....	
12,500	50,000	.009333	.001000	....	....	
21,310	85,240	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,240
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inches..	.2433
Elongation per inch under strain at elastic limit	do...	.001500
Deduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1″.5 from neck.
Character of broken surface		silky
Elongation of inch sections		″.13, ″.39*, ″.21

No. 4679.

Marks, $\begin{smallmatrix}10\ R_{14}\ T\\ M\ T_2\ M\end{smallmatrix}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20.000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	....	....	
8,750	35,000	.001167	.000167	0.	....	
10,000	40,000	.001333	.000166	0.	....	
10,250	41,000	.001367	.000034	....	....	
10,500	42,000	.001400	.000033	....	....	
10,750	43,000	.001433	.000033	....	....	
11,000	44,000	.001467	.000034	....	....	
11,250	45,000	.001533	.000066	....	....	
11,500	46,000	.001600	.000067	....	....	
11,750	47,000	.001667	.000067	....	....	
12,000	48,000	.001700	.000033	....	....	
12,250	49,000	.001733	.000033	....	....	Elastic limit.
12,500	50,000	.004000	.002267	....	....	
12,750	51,000	.007300	.003300	....	....	
13,000	52,000	.007833	.000533	....	....	
13,250	53,000	.008333	.000500	....	....	
13,500	54,000	.009333	.001000	....	....	
22,710	90,840	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds.. 90,840
Elastic limit per square inch of original section ....do... 49,000
Elongation per inch after rupture................................inch.. .2100
Elongation per inch under strain at elastic limit................................do... .001733
Reduction in diameter at point of rupture................................do... .144
Reduction in area after rupture, per cent of original section 44.6
Position of rupture................................ 1″.15 from neck
Character of broken surface ....silky
Elongation of inch sections ....″.12, ″.19, ″.32

JACKET No. 3.

No. 4513.

Marks, $\begin{smallmatrix}\text{10 R, J}\\ \text{B T, M}\end{smallmatrix}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000267	.000200	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001067	.000134	0.	....	
10,000	40,000	.001267	.000200	....	....	
10,500	42,000	.001300	.000033	0.	....	
10,750	43,000	.001333	.000033	....	....	
11,000	44,000	.001367	.000034	....	....	
11,250	45,000	.001400	.000033	....	....	
11,500	46,000	.001433	.000033	....	....	
11,750	47,000	.001433	0.	....	....	
12,000	48,000	.001500	.000067	....	....	
12,250	49,000	.001533	.000033	....	....	
12,500	50,000	.001567	.000034	....	....	
12,750	51,000	.001600	.000033	....	....	
13,000	52,000	.001633	.000033	....	....	
13,250	53,000	.001700	.000067	....	....	
13,500	54,000	.001733	.000033	....	....	Elastic limit.
13,750	55,000	.002000	.000267	....	....	
14,000	56,000	.003167	.001167	....	....	
14,250	57,000	.003600	.000433	....	....	
14,500	58,000	.004600	.001000	....	....	
14,750	59,000	.004933	.000333	....	....	
26,310	105,240	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	105,240
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	.1600
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.065
Reduction in area after rupture, per cent of original section		21.4
Position of rupture		1″.6 from neck
Character of broken surface		granular, radiating from a point in the circumference
Elongation of inch sections		″.12, ″.22*, ″.14

No. 975.

Marks, $^{10\ R.\ J.}_{B\ T.\ M.}$
Length, 5″.
Diameter, 1″.103.
Sectional area, .956 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
956	1,000	0.	0.	0.	0.	
4,780	5,000	.000100	.000100	0.	....	
9,560	10,000	.000200	.000100	....	....	
14,340	15,000	.000375	.000175	....	....	
19,120	20,000	.090525	.000150	....	....	
23,900	25,000	.000700	.000175	....	....	
28,680	30,000	.000875	.000175	....	....	
33,460	35,000	.001000	.000125	....	....	
38,240	40,000	.001200	.000200	—.000025	—.000025	
43,020	45,000	.001325	.000125	0.	+.000025	
43,976	46,000	.001375	.000050	....	....	
44,932	47,000	.001425	.000050	....	....	
45,888	48,000	.001450	.000025	....	....	
46,844	49,000	.001475	.000025	....	....	
47,800	50,000	.001500	.000025	0.	....	
48,756	51,000	.001525	.000025	....	....	
49,712	52,000	.001575	.000050	....	....	
50,668	53,000	.001625	.000050	....	....	Elastic limit.
51,624	54,000	.005625	.004000	....	....	
52,580	55,000	.006175	.000550	....	....	
53,536	56,000	.006650	.000475	....	....	
55,448	58,000	.007950	.001300	....	....	
57,360	60,000	.009350	.001400	....	....	
59,272	62,000	.010600	.001250	....	....	
61,184	64,000	.012025	.001425	....	....	
63,096	66,000	.013450	.001425	....	....	
65,008	68,000	.014900	.001450	....	....	
66,920	70,000	.016450	.001550	....	....	
105,100	109,940	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 4512.

Marks, $\frac{10\ R,\ J}{M\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.		
2,500	10,000	.000267	.000200			
5,000	20,000	.000600	.000333			
7,500	30,000	.000933	.000333			
8,750	35,000	.001067	.000134			
10,000	40,000	.001267	.000200			
10,500	42,000	.001333	.000066	0.		
10,750	43,000	.001367	.000034			
11,000	44,000	.001400	.000033			
11,250	45,000	.001433	.000033			
11,500	46,000	.001467	.000034			
11,750	47,000	.001500	.000033			
12,000	48,000	.001533	.000033			
12,250	49,000	.001600	.000067			
12,500	50,000	.001633	.000033			
12,750	51,000	.001667	.000034			
13,000	52,000	.001700	.000033			
13,250	53,000	.001733	.000033			
13,500	54,000	.001800	.000067			Elastic limit.
13,750	55,000	.001967	.000167			
14,000	56,000	.002533	.000566			
14,250	57,000	.003333	.000800			
14,500	58,000	.004000	.000667			
14,750	59,000	.004667	.000667			
25,620	102,480					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	102,480
Elastic limit per square inch of original section	do	54,000
Elongation per inch after rupture	inch	.1900
Elongation per inch under strain at elastic limit	do	.001800
Reduction in diameter at point of rupture	do	.094
Reduction in area after rupture, per cent of original section		30.6
Position of rupture		″.75 from neck
Character of broken surface		granular 70 per cent, silky 30 per cent
Elongation of inch sections		″.28*, ″.18, ″.11

JACKET NO. 4.

No. 4526.

Marks, $\overset{10\ \mathrm{R,\ J}}{\mathrm{B\ T,\ M}}$
Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000300	.000200	....	....	
5,000	20,000	.000600	.000300	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001100	.000167	0.	....	
10,000	40,000	.001267	.000167	....	....	
10,500	42,000	.001333	.000066	0.	....	
10,750	43,000	.001367	.000034	....	....	
11,000	44,000	.001400	.000033	....	....	
11,250	45,000	.001433	.000033	....	....	
11,500	46,000	.001467	.000034	....	....	
11,750	47,000	.001533	.000066	....	....	
12,000	48,000	.001600	.000067	....	....	
12,250	49,000	.001633	.000033	....	....	Elastic limit.
12,500	50,000	.008833	.007200	....	....	
12,750	51,000	.009200	.000367	....	....	
13,000	52,000	.010000	.000800	....	....	
13,250	53,000	.010933	.000933	....	....	
13,500	54,000	.012267	.001334	....	....	
22,030	88,120	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,120
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.220
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1''.3 from neck
Character of broken surface		silky
Elongation of inch sections		''.12, ''.27*, ''.27*

JACKET No. 5.

No. 998.

Marks, $\overset{10\ R, J}{B\ T, M}$
Length, 5″.
Diameter′ 1″.127.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000100	.000100	....	....	
10,000	10,000	.000225	.000125	....	....	
15,000	15,000	.000350	.000125	....	....	
20,000	20,000	.000500	.000150	....	....	
25,000	25,000	.000625	.000125	....	....	
30,000	30,000	.000775	.000150	....	....	
35,000	35,000	.000950	.000175	....	....	
40,000	40,000	.001150	.000200	.000075	.000075	Elastic limit.
41,000	41,000	.001250	.000100	....	....	
42,000	42,000	.001325	.000075	....	....	
43,000	43,000	.001375	.000050	....	....	
44,000	44,000	.001950	.000575	....	....	
45,000	45,000	.003575	.001625	.002175	.002100	
46,000	46,000	.004200	.000625	....	....	
48,000	48,000	.006050	.001850	....	....	
50,000	50,000	.007375	.001325	....	....	
52,000	52,000	.008875	.001500	....	....	
54,000	54,000	.010300	.001425	....	....	
56,000	56,000	.012025	.001725	....	....	
58,000	58,000	.013375	.001350	....	....	
60,000	60,000	.015150	.001775	....	....	
62,000	62,000	.016450	.001300	....	....	
64,000	64,000	.018350	.001900	....	....	
66,000	66,000	.019875	.001525	....	....	
68,000	68,000	.021850	.001975	....	....	
70,000	70,000	.024000	.002150	....	....	
101,460	101,460	....	....	....	....	Ultimate strength.

Failed by triple flexure.

JACKET No. 6.

No. 4593.

Marks, $^{10\ \text{R. J}}_{\text{B T. M}}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000267	.000200	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000967	.000367	....	....	
8,750	35,000	.001133	.000166	0.	....	
10,000	40,000	.001333	.000200	....	....	
10,500	42,000	.001400	.000067	0.	....	
10,750	43,000	.001433	.000033	....	....	
11,000	44,000	.001467	.000034	....	....	
11,250	45,000	.001500	.000033	....	....	
11,500	46,000	.001567	.000067	....	....	
11,750	47,000	.001633	.000066	....	....	Elastic limit.
12,000	48,000	.002667	.001034	....	....	
12,250	49,000	.005733	.003066	....	....	
12,500	50,000	.006500	.000767	....	....	
12,750	51,000	.007067	.000567	....	....	
13,000	52,000	.008167	.001100	....	....	
22,980	91,920	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	91,920
Elastic limit per square inch of original section	do	47,000
Elongation per inch after rupture	inch	.230
Elongation per inch under strain at elastic limit	do	.001633
Reduction in diameter at point of rupture	do	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″.65 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.19, ″.37*, ″.14

No. 4592.

Marks, $\genfrac{}{}{0pt}{}{\mathrm{10\ B.\ J}}{\mathrm{M\ T.\ M}}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000267	.000200	....	....	
5,000	20,000	.000567	.000300	....	....	
7,500	30,000	.000900	.000333	....	....	
8,750	35,000	.001067	.000167	0.	....	
10,000	40,000	.001300	.000233	....	....	
10,500	42,000	.001367	.000067	0.	....	
10,750	43,000	.001400	.000033	....	....	
11,000	44,000	.001433	.000033	....	....	
11,250	45,000	.001467	.000034	....	....	
11,500	46,000	.001533	.000066	....	....	
11,750	47,000	.001600	.000067	....	....	Elastic limit.
12,000	48,000	.001867	.000267	....	....	
12,250	49,000	.002600	.000733	....	....	
12,500	50,000	.004733	.002133	....	....	
12,750	51,000	.005400	.000667	....	....	
13,000	52,000	.006667	.001267	....	....	
23,020	92,080	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,080
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.200
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.20, ″.28

JACKET NO. 9.

No. 4602.

Marks, $^{10\ R,\ J}_{B\ T,\ M}$
Diameter, ″.564.
Sectional area, 25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000133	.000133	0.	....	
2, 500	10, 000	.000300	.000167	....	....	
5, 000	20, 000	.000667	.000367	....	....	
7, 500	30, 000	.001033	.000366	....	....	
8, 750	35, 000	.001233	.000200	.000067	.000067	
10, 000	40, 000	.001367	.000134	....	....	
10, 500	42, 000	.001467	.000100	.000067	0.	
10, 750	43, 000	.001533	.000066	....	....	
11, 000	44, 000	.001600	.000067	....	....	
11, 250	45, 000	.001633	.000033	....	....	Elastic limit.
11, 500	46, 000	.001867	.000234	....	....	
11, 750	47, 000	.003167	.001300	....	....	
12, 000	48, 000	.004667	.001500	....	....	
12, 250	49, 000	.005500	.000833	....	....	
12, 500	50, 000	.006667	.001167	....	....	
22, 690	90, 760	....	....	....	....	Tensile strength.

General summary.

Tensile strength, per square inch of original section	pounds	90, 760
Elastic limit, per square inch of original section	do	45, 000
Elongation per inch after rupture	inch	.220
Elongation per inch under strain at elastic limit	do	.001633
Reduction in diameter at point of rupture	do	.124
Reduction in area after rupture, per cent of original section		39. 2
Position of rupture		1″ from neck
Character of broken surface		silky 50 per cent, granular 50 per cent
Elongation of inch sections		″.16, ″.19, ″.31*

No. 4603.

Marks, $\frac{10\ R,\ J}{M\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000100	.000100	0.	....	
2, 500	10, 000	.000267	.000167	....	....	
5, 000	20, 000	.000600	.000333	....	....	
7, 500	30, 000	.000933	.000333	....	....	
8, 750	35, 000	.001100	.000167	0.		
10, 000	40, 000	.001267	.000167	....	....	
10, 500	42, 000	.001333	.000066	0.		
10, 750	43, 000	.001367	.000034	....	....	
11, 000	44, 000	.001400	.000033	....	....	
11, 250	45, 000	.001467	.000067	....	....	
11, 500	46, 000	.001533	.000066	....	....	Elastic limit.
11, 750	47, 000	.001700	.000167	....	....	
12, 000	48, 000	.002067	.000367	....	....	
12, 250	49, 000	.002500	.000433	....	....	
12, 500	50, 000	.003100	.000600	....	....	
12, 750	51, 000	.003967	.000867	....	....	
23, 790	95, 160	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95, 160
Elastic limit per square inch of original section	do....	46, 000
Elongation per inch after rupture	inch..	.2033
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1″.5 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.15, ″.33, ″.13

JACKET NO. 12.

No. 4615.

Marks, $\frac{10\,R_{11}\,J}{B\,T_1\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	....	
2,500	10,000	.000333	.000200	....	....	
5,000	20,000	.000700	.000367	....	....	
7,500	30,000	.001033	.000333	....	....	
8,750	35,000	.001233	.000200	0.	....	
10,000	40,000	.001367	.000034	....	....	
10,500	42,000	.001433	.000066	.000033	.000033	
10,750	43,000	.001467	.000034	....	....	
11,000	44,000	.001533	.000066	....	....	
11,250	45,000	.001567	.000034	....	....	
11,500	46,000	.001633	.000066	....	....	
11,750	47,000	.001667	.000034	....	....	
12,000	48,000	.001700	.000033	....	....	
12,250	49,000	.001733	.000033	....	....	
12,500	50,000	.001767	.000034	....	....	
12,750	51,000	.001833	.000066	....	....	Elastic limit.
13,000	52,000	.002500	.000667	....	....	
13,250	53,000	.005433	.002933	....	....	
13,500	54,000	.006167	.000734	....	....	
13,750	55,000	.006833	.000666	....	....	
14,000	56,000	.008167	.001334	....	....	
23,980	95,920	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	95,926
Elastic limit per square inch of original section	do	51,000
Elongation per inch after rupture	inch	.2033
Elongation per inch under strain at elastic limit	do	.001833
Reduction in diameter at point of rupture	do	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		″.14, ″.32, * ″.15

No. 4614.

Marks, $^{10\ R\ n\ J}_{M\ T\ ,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged, length 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	....	
2,500	10,000	.000300	.000167	....	....	
5,000	20,000	.000633	.000333	....	....	
7,500	30,000	.000933	.000300	....	....	
8,750	35,000	.001067	.000134	0.	....	
10,000	40,000	.001267	.000200	....	....	
10,500	42,000	.001367	.000100	0.	....	
10,750	43,000	.001400	.000033	....	....	
11,000	44,000	.001433	.000033	....	....	
11,250	45,000	.001467	.000034	....	....	
11,500	46,000	.001500	,000033	....	....	
11,750	47,000	.001567	.000067	....	....	
12,000	48,000	.001600	.000033	....	....	
12,250	49,000	.001633	.000033	....	....	
12,500	50,000	.001667	.000034	....	....	
12,750	51,000	.001733	.000066	....	....	Elastic limit.
13,000	52,000	.002467	.000734	....	....	
13,250	53,000	.003833	.001366	....	....	
13,500	54,000	.004933	.001100	....	....	
13,750	55,000	.005933	.001000	....	....	
14,000	56,000	.006833	.000900	....	....	
23,740	94,960	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,960
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2033
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1.″21 from neck
Character of broken surface		silky
Elongation of inch sections		″.15, ″.25*, ″.21*

JACKET No. 13.

No. 4674.

Marks, $^{10\ R_{13}\ J}_{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000067	000067	0.	....	
2, 500	10, 000	.000300	.000233	....	....	
5, 000	20. 000	.000633	.000333	....	....	
7, 500	30, 000	.001000	.000367	....	....	
8, 750	35, 000	.001200	.000200	0.	....	
10, 000	40, 000	.001367	.000167	....	....	
10, 500	42, 000	.001400	.000033	0.	....	
10, 750	43, 000	.001433	.000033	....	....	
11, 000	44, 000	.001500	.000067	....	....	
11, 250	45, 000	.001567	.000067	....	....	
11, 500	46, 000	.001633	.000066	....	....	
11, 750	47, 000	.001667	.000034	....	....	
12, 000	48, 000	.001733	.000066	....	....	Elastic limit.
12, 250	49, 000	.003033	.001300	....	....	
12, 500	50, 000	.005167	.002134	....	....	
12, 750	51, 000	.006333	.001166	....	....	
13, 000	52, 000	.007333	.001000	....	....	
12, 250	53, 000	.008000	.000667	....	....	
22, 540	90, 160	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90, 160
Elastic limit per square inch of original section	do..	48, 000
Elongation per inch after rupture	inch..	.2033
Elongation per inch under strain at elastic limit	do..	.001733
Reduction in diameter at point of rupture	do..	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.3 from neck
Character of broken surface		silky
Elongation of inch sections		″.18, ″.32*, ″.11

No. 4673.

Marks, $\frac{10}{M}\frac{R_{18}}{T_4}\frac{J}{M}$
Diameter, ''.563.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000333	.000266	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	....	....	
8,750	35,000	.001233	.000233	0.	....	
10,000	40,000	.001367	.000134	....	....	
10,500	42,000	.001400	.000033	0.	....	
10,750	43,000	.001467	.000067	....	....	
11,000	44,000	.001500	.000033	....	....	
11,250	45,000	.001567	.000067	....	....	
11,500	46,000	.001600	.000033	....	....	
11,750	47,000	.001633	.000033	....	....	Elastic limit.
12,000	48,000	.002167	.000534	....	....	
12,250	49,000	.003667	.001500	....	....	
12,500	50,000	.005333	.001666	....	....	
12,750	51,000	.006000	.000667	....	....	
13,000	52,000	.006667	.000667	....	....	
22,620	90,480	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,480
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2233
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1''.56 from neck.
Character of broken surface		silky, trace of granulation.
Elongation of inch sections		''.17, ''.36*, ''.14

10-INCH STEEL B. L. RIFLES.

SPECIFIC GRAVITY AND HARDNESS OF TUBES, JACKETS, AND HOOPS.

No tension tests of these specimens.

Number of rifle.	Position in rifle.	Marks on specimen.	Specific gravity.	Hardness.
4	Tube	10 R_4 T—B R_5 M	7.8550	20.70
5	....do	10 R_5 T—B R_5 M	7.8539	16.47
6	....do	10 R_6 T—B R_5 M	7.8594	20.36
7	....do	10 R_7 T—B R_5 M	7.8635	18.48
8	....do	10 R_8 T—B R_5 M	7.8632	20.47
8	Jacket	10 R_8 J—B R_{10} M	7.8542	21.52
4	....do	10 R_4 J—B R_6 M	7.8543	16.47
5	....do	10 R_5 J—B R_6 M	7.8634	18.38
6	Hoop A_4	10 R_6 A_4—R_4 M	7.8527	22.64

TABULATION OF TENSION SPECIMENS FROM 10-INCH STEEL B. L. RIFLES.

[Stems 3 inches long, .564 inch diameter.]

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*P. cent.*	*P. cent.*	
4534	Tube No. 4	Middle	48,000	95,000	19.7	33.5	Granular, 75 per cent; silky, 25 per cent.*
4533	....do	...do	48,000	92,840	18.7	41.9	Silky.†
4583	Tube No. 7	...do	47,000	92,140	22.7	45.0	Do.*
4582	....do	...do	44,000	89,360	22.3	47.4	Do.†
4609	Tube No. 10	...do	48,000	91,920	21.7	41.9	Silky, serrated.*
4608	....do	...do	50,000	89,960	21.0	39.2	Granular, 60 per cent; silky, 40 per cent.†
4617	Tube No. 15	...do	48,000	96,560	18.7	36.4	Silky, serrated.*
4616	....do	...do	46,000	92,440	13.8	15.0	Granular, flaky spot at circumference.†
4680	Tube No. 16	...do	45,000	85,240	24.8	52.2	Silky.*
4679	....do	...do	49,000	90,840	21.0	44.6	Do.†
4513	Jacket No. 3	...do	54,000	105,240	16.0	21.4	Granular.*
4512	....do	...do	54,000	102,480	19.0	30.6	Granular, 70 per cent; silky, 30 per cent.†
4526	Jacket No. 4	...do	49,000	88,120	22.0	44.6	Silky.*
4525	....do	...do	51,000	97,040	19.0	39.2	Do.†
4593	Jacket No. 6	...do	47,000	91,920	23.0	41.9	Silky, serrated.*
4592	....do	...do	47,000	92,080	20.0	47.2	Silky.†
4602	Jacket No. 9	...do	45,000	90,760	22.0	39.2	Silky, 50 per cent; granular, 50 per cent.*
4603	....do	...do	46,000	95,160	20.3	39.2	Silky, serrated.†
4615	Jacket No. 12	...do	51,000	95,920	20.3	39.2	Silky.*
4614	....do	...do	51,000	94,960	20.8	44.6	Do.†
4674	Jacket No. 13	...do	48,000	90,160	20.3	47.2	Do.*
4673	....do	...do	47,000	90,480	22.8	39.2	Silky, trace of granulation.†

* Breech end. † Muzzle end.

TABULATION OF COMPRESSION SPECIMENS FROM 10-INCH STEEL B. L. RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.
			Pounds.	*Pounds.*	
990	Tube No. 4	Middle	50,000	102,200	Double flexure.*
991	Tube No. 5	....do	43,000	95,230	Do.*
974	Tube No. 6	....do	50,000	108,400	Triple flexure.*
999	Tube No. 7	....do	48,000	102,860	Do.*
1,000	Tube No. 8	....do	49,000	106,400	Do.*
975	Jacket No. 3	....do	53.000	109,940	Do.*
976	Jacket No. 4	....do	48,000	97,520	Do.*
998	Jacket No. 5	....do	40,000	101,460	Do.*

* Breech end.

10-INCH WIRE-WRAPPED B. L. RIFLE (CROZIER).

SPECIMENS FROM JACKET.

No. 4704.

Marks, $^{10\ W\ R,\ J}_{B\ T,\ O}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.090333	0.	....	
7,750	31,000	.001033	.000033	....	....	
8,000	32,000	.001067	.000034	....	....	
8,250	33,000	.091133	.000066	....	....	
8,500	34,000	.001200	.000067	....	....	
8,750	35,000	.001267	.000067	0.	....	Elastic limit.
9,000	36,000	.001500	.000233	....	....	
9,250	37,000	.001967	.000467	....	....	
9,500	38,000	.002933	.009966	....	....	
9,750	39,000	.004067	.001134	....	....	
10,000	40,000	.005333	.001266	....	....	
18,390	73,560	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section .... pounds..	73,560
Elastic limit per square inch of original section .... do...	35,000
Elongation per inch after rupture .... inch..	.2067
Elongation per inch under strain at elastic limit .... do...	.001267
Reduction in diameter at point of rupture .... do..	.125
Reduction in area after rupture, per cent of original section	39.2
Position of rupture	1″.2 from neck
Character of broken surface	silky
Elongation of inch sections	″.11, ″.18, ″.33*

No. 4705.

Marks, $\genfrac{}{}{0pt}{}{\text{10 W R, J}}{\text{B T, M}}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000100	.000100	0.	....	
2, 500	10, 000	.000333	.000233	....	....	
5, 000	20, 000	.000667	.000334	....	....	
7, 500	30, 000	.001100	.000433	.000033	.000033	Elastic limit.
7, 750	31, 000	.001200	.000100	....	....	
8, 000	32, 000	.002000	.000800	....	....	
8, 250	33, 000	.003400	.001400	....	....	
8, 500	34, 000	.004600	.001200	....	....	
8, 750	35, 000	.005333	.000733	....	....	
17, 240	68, 960	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	68, 960
Elastic limit per square inch of original section	do...	30, 000
Elongation per inch after rupture	inch..	.2633
Elongation per inch under strain at elastic limit	do...	.001100
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49. 7
Position of rupture		1″.1 from neck
Character of broken surface		silky
Elongation of inch sections		″.40*, ″.21, ″.18

No. 4706.

Marks, $^{10\,W\,R,\,J}_{B\,T,\,M}$
Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001033	.000366	0.	....	
7,750	31,000	.001067	.000034	....	....	
8,000	32,000	.001133	.000066	....	....	
8,250	33,000	.001200	.000067	....	....	
8,500	34,000	.001267	.000067	....	....	
8,750	35,000	.001333	.000066	.000033	.000033	
9,000	36,000	.001400	.000067	....	....	Elastic limit.
9,250	37,000	.001933	.000533	....	....	
9,500	38,000	.003667	.001734	....	....	
9,750	39,000	.004667	.001000	....	....	
10,000	40,000	.006000	.001333	....	....	
10,250	41,000	.007133	.001133	....	....	
18,210	72,840	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	72,840
Elastic limit per square inch of original section	do...	36,000
Elongation per inch after rupture	inch..	.2567
Elongation per inch under strain at elastic limit	do...	.001400
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1''.4 from neck
Character of broken surface		silky
Elongation of inch sections		''.16, ''.38*, ''.23

No. 4707.

Marks, $^{10\ W\ R_1\ J}_{\ B\ T_4\ M}$
Diameter ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	0.	....	
7,750	31,000	.001067	.000067	....	....	
8,000	32,000	.001133	.000066	....	....	
8,250	33,000	.001233	.000100	....	....	
8,500	34,000	.001300	.000067	....	....	Elastic limit.
8,750	35,000	.003667	.002367	....	....	
9,000	36,000	.004500	.000833	....	....	
9,250	37,000	.005067	.000567	....	....	
9,500	38,000	.006333	.001266	....	....	
9,750	39,000	.007700	.001367	....	....	
17,750	71,000	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	71,000
Elastic limit per square inch of original section	do...	34,000
Elongation per inch after rupture	inch..	.2567
Elongation per inch under strain at elastic limit	do...	.001300
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.7 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.44*, ″.19

No. 4700.

Marks, $^{10\ \mathrm{W\ R,\ J}}_{\mathrm{M\ T,\ O}}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,250	29,000	.001000	.000333	....	....	Elastic limit.
7,500	30,000	.001333	.000333	.000267	.000267	
7,750	31,000	.001800	.000467	....	....	
8,000	32,000	.002300	.000500	....	....	
8,250	33,000	.002667	.000367	....	....	
8,500	34,000	.003433	.000766	....	....	
17,540	70,160	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	70,160
Elastic limit per square inch of original section	do	29,000
Elongation per inch after rupture	inch	.270
Elongation per inch under strain at elastic limit	do	.001000
Reduction in diameter at point of rupture	do	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1″.08 from neck
Character of broken surface		silky
Elongation of inch sections		″.18, ″.22, ″.41

No. 4701.

Marks, $^{10\ W\ R,\ J}_{M\ T,\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,000	28,000	.000933	.000266	....	....	Elastic limit.
7,250	29,000	.001100	.000167	....	....	
7,500	30,000	.001467	.000367	.000367	.000367	
7,750	31,000	.001833	.000366	....	....	
8,000	32,000	.002467	.000634	....	....	
8,250	33,000	.003000	.000533	....	....	
8,500	34,000	.003867	.000867	....	....	
8,750	35,000	.004667	.000800	....	....	
17,510	70,040	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section........................pounds..	70,040
Elastic limit per square inch of original section........................do...	28,000
Elongation per inch after rupture........................inch..	.260
Elongation per inch under strain at elastic limit........................do...	.000933
Reduction in diameter at point of rupture........................do...	.164
Reduction in area after rupture, per cent of original section........................	49.7
Position of rupture........................	1".7 from neck
Character of broken surface........................	silky
Elongation of inch sections........................	".14, ".42*, ".22

No. 4702.

Marks, $\begin{smallmatrix}\text{10 W R, J}\\ \text{M T, M}\end{smallmatrix}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000700	.000367	....	....	
6,750	27,000	.000933	.000233	....	....	Elastic limit.
7,000	28,000	.001100	.000167	....	....	
7,250	29,000	.001300	.000200	....	....	
7,500	30,000	.001700	.000400	.000600	.000600	
7,750	31,000	.002500	.000800	....	....	
8,000	32,000	.003033	.000533	....	....	
8,250	33,000	.003667	.000634	....	....	
8,500	34,000	.004333	.000666	....	....	
8,750	35,000	.005600	.001267	....	....	
17,140	68,560	....	....	....	....	Tensile strength.

General summary.

Tensile strength, per square inch of original section	pounds	68,560
Elastic limit per square inch of original section	do	27,000
Elongation per inch after rupture	inch	.2567
Elongation per inch under strain at elastic limit	do	.000933
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1".7 from neck
Character of broken surface		silky
Elongation of inch sections		".18, ".42*, ".17

No. 4703.

Marks, $\overset{10\ W\ R_1\ J}{M\ T_4\ 1}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000300	.000233	....	....	
5,000	20,000	.000667	.000367	....	....	
6,250	25,000	.000867	.000200	0.	....	
6,500	26,000	.000933	.000066	....	....	
6,750	27,000	.000967	.000034	....	....	
7,000	28,000	.001000	.000033	....	....	
7,250	29,000	.001033	.000033	....	....	Elastic limit.
7,500	30,000	.001133	.000100	....	....	
7,750	31,000	.001367	.000234	....	....	
8,000	32,000	.001700	.000333	....	....	
8,250	33,000	.002067	.000367	....	....	
8,500	34,000	.003000	.000933	....	....	
8,750	35,000	.003967	.000967	....	....	
17,890	71,560	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	71,560
Elastic limit per square inch of original section	do...	29,000
Elongation per inch after rupture	inch..	.2367
Elongation per inch under strain at elastic limit	do...	.001033
Reduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1″.1 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.18, ″.41*

TABULATION OF TENSION SPECIMENS FROM 10-INCH WIRE-WRAPPED B. L. RIFLE (CROZIER).

[Stems 3 inches long, ″.564 diameter.]

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
4704	Jacket No. 1...	Outside.	35,000	73,560	20.7	39.2	Silky.*
4705	....do............	Middle .	30,000	68,960	26.3	49.7	Do.*
4706	....do............	....do ...	36,000	72,840	25.7	47.2	Do.*
4707	....do............	....do ...	34,000	71,000	25.7	49.7	Do.*
4700	....do............	Outside.	29,000	70,160	27.0	52.2	Do.†
4701	....do............	Middle .	28,000	70,040	26.0	49.7	Do.†
4702	....do............	....do ...	27,000	68,560	25.7	49.7	Do.†
4703	....do............	Inside ..	29,000	71,560	23.7	52.2	Do.†

* Breech end. † Muzzle end.

12-INCH STEEL B. L. RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE No. 2.

No. 962.

Marks, $\overset{12\text{ R, T}}{\text{B T, M}}$
Length, 5″.
Diameter, 1″.128.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
5,000	5,000	.000125	.000125	....	....	
10,000	10,000	.000250	.000125	....	....	
15,000	15,000	.000400	.000150	....	....	
20,000	20,000	.000575	.000175	....	....	
25,000	25,000	.000750	.000175	....	....	
30,000	30,000	.000925	.000175	0.	....	
35,000	35,000	.001100	.000175	....	....	
40,000	40,000	.001300	.000200	0.	....	
41,000	41,000	.001325	.000025	....	....	
42,000	42,000	.001375	.000050	....	....	
43,000	43,000	.001425	.000050	....	....	
44,000	44,000	.001475	.000050	....	....	
45,000	45,000	.001525	.000050	....	....	Elastic limit.
46,000	46,000	.002125	.000600	....	....	
47,000	47,000	.004375	.002250	....	....	
48,000	48,000	.005250	.000875	....	....	
49,000	49,000	.006000	.000750	....	....	
50,000	50,000	.006425	.000425	....	....	
51,000	51,000	.007200	.000775	....	....	
52,000	52,000	.008150	.000950	....	....	
54,000	54,000	.010000	.001850	....	....	
56,000	56,000	.011550	.001550	....	....	
58,000	58,000	.013125	.001575	....	....	
60,000	60,000	.014300	.001175	....	....	
62,000	62,000	.016700	.002400	....	....	
64,000	64,000	.018250	.001550	....	....	
66,000	66,000	.020300	.002050	....	....	
68,000	68,000	.022175	.001875	....	....	
70,000	70,000	.024425	.002250	....	....	
100,700	100,700	....	....	....	....	Ultimate strength.

Failed by triple flexure.

TUBE No. 3.

No. 989.

Marks, $\genfrac{}{}{0pt}{}{\text{B R, T}}{\text{B T, M}}$
Length, 5″.
Diameter, 1″.118.
Sectional area, .982 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
982	1,000	0.	0.	0.	0.	Initial load.
4,910	5,000	.000050	.000050	0.	....	
9,820	10,000	.000175	.000125	....	....	
14,730	15,000	.000300	.000125	....	....	
19,640	20,000	.000450	.000150	....	....	
24,550	25,000	.000600	.000150	....	....	
29,460	30,000	.000800	.000200	....	....	
34,370	35,000	.000950	.000150	0.	....	
39,280	40,000	.001125	.000175	.000025	.000025	
40,262	41,000	.001175	.000050	....	....	
41,244	42,000	.001200	.000025	....	....	
42,226	43,000	.001250	.000050	....	....	
43,208	44,000	.001300	.000050	....	....	
44,190	45,000	.001350	.000050	....	....	
45,172	46,000	.001425	.000075	....	....	
46,154	47,000	.001475	.000050	....	....	Elastic limit.
47,136	48,000	.002425	.000950	....	....	
48,118	49,000	.003000	.000575	....	....	
49,100	50,000	.003800	.000800	.002100	.002075	
51,064	52,000	.005175	.001375	....	....	
53,028	54,000	.006325	.001150	....	....	
54,992	56,000	.007875	.001550	....	....	
56,956	58,000	.009625	.001750	....	....	
58,920	60,000	.011000	.001375	.008800	.006700	
60,884	62,000	.012125	.001125	....	....	
62,848	64,000	.014000	.001875	....	....	
64,812	66,000	.015525	.001525	....	....	
66,776	68,000	.017075	.001550	....	....	
68,740	70,000	.019400	.002325	.016700	.007900	
101,600	103,460	....	....	....	....	Ultimate strength.

Failed by triple flexure.

TUBE No. 5.

No. 4663.

Marks, $\begin{smallmatrix}12\ R.\ T\\ B\ T,\ M\end{smallmatrix}$
Diameter, ″.563.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000300	.000200	....	....	
5,000	20,000	.000633	.000333	....	....	
7,500	30,000	.001000	.000367	....	....	
8,750	35,000	.001133	.000133	0.	....	
10,000	40,000	.001400	.000267	.000067	.000067	
10,250	41,000	.001433	.000033	....	....	Elastic limit.
10,500	42,000	.001533	.000100	....	....	
10,750	43,000	.001667	.000134	....	....	
11,000	44,000	.003667	.002000	....	....	
11,250	45,000	.004433	.000766	....	....	
11,500	46,000	.005667	.001234	....	....	
21,640	86,560	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,560
Elastic limit per square inch of original section	do...	41,000
Elongation per inch after rupture	inch..	.2167
Elongation per inch under strain at elastic limit	do...	.001433
Reduction in diameter at point of rupture	do...	.153
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.4 from neck
Character of broken surface		silky
Elongation of inch sections		″.21, ″.32*, ″.12

TUBE No. 5.

No. 4662.

Marks, $\frac{12\ R,\ T}{M\ T_1\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000300	.000233	....	....	
5,000	20,000	.000633	.000333	....	....	
7,500	30,000	.000967	.000334	....	....	
8,750	35,000	.001133	.000166	0.	....	
10,000	40,000	.001333	.000200	0.	....	
10,250	41,000	.001367	.000034	....	....	
10,500	42,000	.001400	.000033	....	....	
10,750	43,000	.001433	.000033	....	....	
11,000	44,000	.001500	.000067	....	....	
11,250	45,000	.001533	.000033	....	....	
11,500	46,000	.001600	.000067	....	....	
11,750	47,000	.001633	.000033	....	....	
12,000	48,000	.001667	.000034	....	....	
12,250	49,000	.001700	.000033	....	....	Elastic limit.
12,500	50,000	.002333	.000633	....	....	
12,750	51,000	.003333	.001000	....	....	
13,000	52,000	.006000	.002667	....	....	
13,250	53,000	.006667	.000667	....	....	
13,500	54,000	.007400	.000733	....	....	
23,370	93,480	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,480
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		".14, ".37*, ".13

TUBE No. 7.

No. 4718.

Marks, $^{12\ R,\ T}_{B\ T,\ M}$
Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	....	
2,500	10,000	.000233	.000166	....	....	
5,000	20,000	.000567	.000334	....	....	
7,500	30,000	.000900	.000333	....	....	
8,750	35,000	.001033	.000133	—.000033	—.000033	
10,000	40,000	.001300	.000267	—.000033	0.	
10,250	41,000	.001333	.000033	....	....	
10,500	42,000	.001367	.000034	....	....	
10,750	43,000	.001400	.000033	....	....	
11,000	44,000	.001433	.000033	....	....	
11,250	45,000	.001467	.000034	....	....	
11,500	46,000	.001533	.000066	....	....	
11,750	47,000	.001567	.000034	....	....	Elastic limit.
12,000	48,000	.002333	.000766	....	....	
12,250	49,000	.003733	.001400	....	....	
12,500	50,000	.005733	.002000	....	....	
12,750	51,000	.006500	.000767	....	....	
13,000	52,000	.007333	.000833	....	....	
22,640	90,560	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of orignal section	pounds	90,560
Elastic limit per square inch of original section	do	47,000
Elongation per inch after rupture	inch	.2200
Elongation per inch under strain at elastic limit	do	.001567
Reduction in diameter at point of rupture	do	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1''.4 from neck
Character of broken surface		silky
Elongation of inch sections		''.13, ''.36*, ''.17

TUBE No. 7.

No. 4717.

Marks, $^{12\ R,\ T}_{M\ T,\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.		
2,500	10,000	.000300	.000233			
5,000	20,000	.000633	.000332			
7,500	30,000	.001000	.000367			
8,750	35,000	.001200	.000200	0.		
10,000	40,000	.001367	.000167	0.		
10,250	41,000	.001400	.000033			
10,500	42,000	.001433	.000033			
10,750	43,000	.001467	.000034			
11,000	44,000	.001533	.000066			
11,250	45,000	.001600	.000067			
11,500	46,000	.001633	.000033			
11,750	47,000	.001667	.000034			
12,000	48,000	.001700	.000033			Elastic limit.
12,250	49,000	.001800	.000100			
		.002667	.000867			
12,500	50,000	.005000	.002333			
12,750	51,000	.007667	.002667			
13,000	52,000	.008333	.000666			
13,250	53,000	.009067	.000734			
21,560	86,240					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	86,240
Elastic limit per square inch of original section	do	48,000
Elongation per inch after rupture	inch	.2167
Elongation per inch under strain at elastic limit	do	.001700
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per cent of original section		49,7
Position of rupture		".95 from neck
Character of broken surface		silky
Elongation of inch sections		".11, ".16, ".38

JACKET NO. 3.

No. 963.

Marks, $\substack{\text{12 R, J.} \\ \text{B T, M.}}$
Length, 5″.
Diameter, ″1.127.
Sectional area, 1 square inch.
Gauged length, 4″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	1, 000	0.	0.	0.	0.	Initial load.
5, 000	5, 000	.000125	.000125			
10, 000	10, 000	.000250	.000125			
15, 000	15, 000	.000400	.000150			
20, 000	20, 000	.000550	.000150			
25, 000	25, 000	.000700	.000150			
30, 000	30, 000	.000875	.000175	0.		
35, 000	35, 000	.001025	.000150			
40, 000	40, 000	.001250	.000225	0.		
41, 000	41, 000	.001275	.000025			
42, 000	42, 000	.001325	.000050			
43, 000	43, 000	.001375	.000050			
44, 000	44, 000	.001400	.000025			
45, 000	45, 000	.001450	.000050			Elastic limit.
46, 000	46, 000	.001575	.000125			
47, 000	47, 000	.002975	.001400			
48, 000	48, 000	.004100	.001125			
49, 000	49, 000	.004750	.000650			
50, 000	50, 000	.005200	.000450			
52, 000	52, 000	.006550	.001350			
54, 000	54, 000	.007925	.001375			
56, 000	56, 000	.009225	.001300			
58, 000	58, 000	.010450	.001225			
60, 000	60, 000	.011775	.001325			
62, 000	62, 000	.013250	.001475			
64, 000	64, 000	.014875	.001625			
66, 000	66, 000	.016450	.001575			
68, 000	68, 000	.017750	.001300			
70, 000	70, 000	.019625	.001875			
72, 000	72, 000	.021600	.001975			
74, 000	74, 000	.023200	.001600			
109, 300	109, 800					Ultimate strength.

Failed by triple flexure.

JACKET NO. 4.

No. 4622.

Marks, $\substack{12\,\mathrm{R}_4\,\mathrm{J} \\ \mathrm{B\,T}_4\,\mathrm{M}}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000267	.000167	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001100	.000167	0.	....	
10,000	40,000	.001267	.000167	....	....	
10,500	42,000	.001333	.000066	0.	....	
10,750	43,000	.001367	.000034	....	....	
11,000	44,000	.001400	.000033	....	....	
11,250	45,000	.001433	.000033	....	....	
11,500	46,000	.001500	.000067	....	....	
11,750	47,000	.001567	.000067	....	....	
12,000	48,000	.001600	.000033	....	....	
12,250	49,000	.001633	.000033	....	....	
12,500	50,000	.001700	.000067	....	....	Elastic limit.
12,750	51,000	.001933	.000233	....	....	
13,000	52,000	.003167	.001234	....	....	
13,250	53,000	.003933	.000766	....	....	
13,500	54,000	.005000	.001067	....	....	
13,750	55,000	.005867	.000867	....	....	
24,360	97,440	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	97,440
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	.2033
Elongation per inch under strain at elastic limit	do	.001700
Reduction in diameter at point of rupture	do	0.144
Reduction in area after rupture, per cent of original section	do	46.6
Position of rupture		″.9 from neck
Character of broken surface		silky
Elongation of inch sections		″.31*, ″.17, ″.13

JACKET NO. 4.

No. 4620.

Marks, $^{12\ B_4\ J}_{M\ T_4\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch,*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load,
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000300	.000200			
5,000	20,000	.000633	.000333			
7,500	30,000	.001000	.000367			
8,750	35,000	.001100	.000100	0.		
10,000	40,000	.001300	.000200			
10,500	42,000	.001367	.000067	0.		
10,750	43,000	.001400	.000033			
11,000	44,000	.001433	,000033			
11,250	45,000	.001467	.000034			
11,500	46,000	.001500	.000033			
11,750	47.000	.001583	.000033			
12,000	48,000	.001567	.000034			
12,250	49,000	.001600	.000033			
12,500	50,000	.001667	.000067			Elastic limit.
12,750	51,000	.001867	.000200			
13,000	52,000	.002067	.000700			
13,250	53,000	.004000	.001333			
13,500	54,000	.005333	.001333			
13,750	55,000	.006167	.000834			
23,810	95,240					Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds..	95,240
Elastic limit per square inch of original section........do...	50,000
Elongation per inch after rupture........inch..	.1833
Elongation per inch under strain at elastic limit........do...	.001667
Reduction in diameter at point of rupture........do...	.144
Reduction in area after rupture, per cent of original section........	44.6
Position of rupture........	1″.5 from neck
Character of broken surface........	granular, 60 per cent; silky, 40 per cent
Elongation of inch sections........	″.15, ″.30*, ″.10

JACKET NO. 4.

No. 4621.

Marks, 12 R. J. M T, M.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	9.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000267	.000167	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000933	.000333	....	....	
8,750	35,000	.001100	.000267	0.	....	
10,000	40,000	.001300	.000200	....	....	
10,500	42,000	.001367	.000067	0.	....	
10,750	43,000	.001400	.000033	....	....	
11,000	44,000	.001467	.000067	....	....	
11,250	45,000	.001500	.000033	....	....	
11,500	46,000	.001567	.000067	....	....	Elastic limit.
11,750	47,000	.001767	.000200	....	....	
12.000	48,005	.003733	.001966	....	....	
12,250	49,000	.004067	.000934	....	....	
12,500	50,000	.005500	.000833	....	....	
12,750	51,000	.006267	.000767	....	....	
22,930	91,720	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,720
Elastic limit per square inch of original section	do...	46,000
Elongation per inch after rupture	inch..	.2167
Elongation per inch under strain at elastic limit	do...	.001567
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		″.2 from middle of stem
Character of broken surface		silky, 60 per cent; granular, 40 per cent
Elongation of inch sections		″.15, ″.35*, ″.15

12-INCH STEEL B. L. RIFLES.

CHEMICAL COMPOSITION OF TUBE No. 2, AND JACKET No. 3.

Compression-test number.	Number of Rifle.	Position in Rifle.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.
			Total.	Graphitic.	Combined.				
962	2	Tube ..	0.252	0.027	0.225	0.672	0.154	0.030	0.025
963	3	Jacket.	0.306	0.009	0.297	0.638	0.150	0.026	0.022

12-INCH STEEL B. L. RIFLES.

SPECIFIC GRAVITY AND HARDNESS OF TUBES, JACKETS, AND HOOPS.

No tension tests of these specimens.

Number of Rifle.	Position in Rifle.	Marks on specimen.	Specific gravity.	Hardness.
2	Tube	12 R_2 T—B R_6 M...........................	7.8550	16.73
3	....do	12 R_3 T—B R_6 M...........................	7.8583	19.39
3	Jacket.........	12 R_3 J—B R_6 M...........................	7.8542	18.58
2	Hoop	12 R_2 A_3—B R_4 M...........................	7.8534	23.84
3	....do	12 R_3 A_3—R_4 M...........................	7.8611	22.14

Tabulation of Tension specimens from 12-inch Steel B. L. Rifles.

[Stems 3 inches long, ".564 diameter.]

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Pr. ct.*	*Pr. ct.*	
4663	Tube No. 5	Middle .	41,000	86,560	21.7	47.2	Silky.*
4662	....do	...do	49,000	93,480	21.3	41.9	Do.†
4718	Tube No. 7	...do	47,000	90,560	22.0	47.2	Do.*
4717	....do	...do	48,000	86,240	21.7	49.7	Do.†
4622	Jacket No. 4 ...	Middle .	50,000	97,440	20.3	46.6	Silky.*
4620	....do	...do	50,000	95,240	18.8	44.6	Granular, 60 per cent; silky, 40 per cent.†
4621	....do	...do	46,000	91,720	21.7	41.9	Granular, 40 per cent; silky, 60 per cent.†

* Breech end. † Muzzle end.

Tabulation of Compression specimens from 12-inch Steel B. L. Rifles.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.
			Pounds.	*Pounds.*	
962	Tube No. 2	Middle	45,000	100,700	Triple flexure*
989	Tube No. 3	....do	47,000	103,460	Do.*
963	Jacket No. 3....	Middle	45,000	109,300	Do.*

* Breech end.

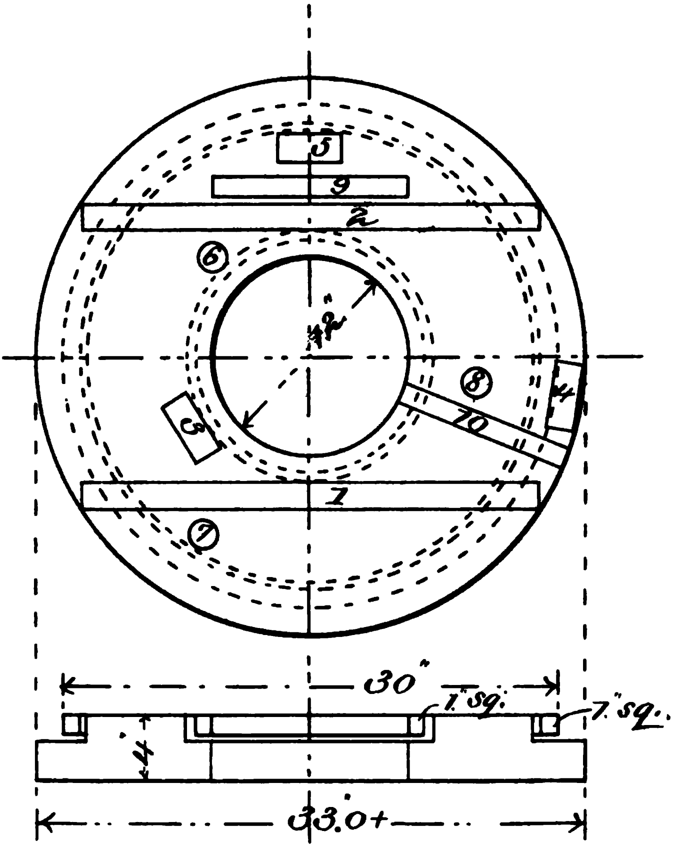
12-INCH B. L. RIFLED MORTARS.

SPECIMENS FROM CAST-IRON BODIES.

12-inch B.L. Rifled Mortars

Cast iron Bodies

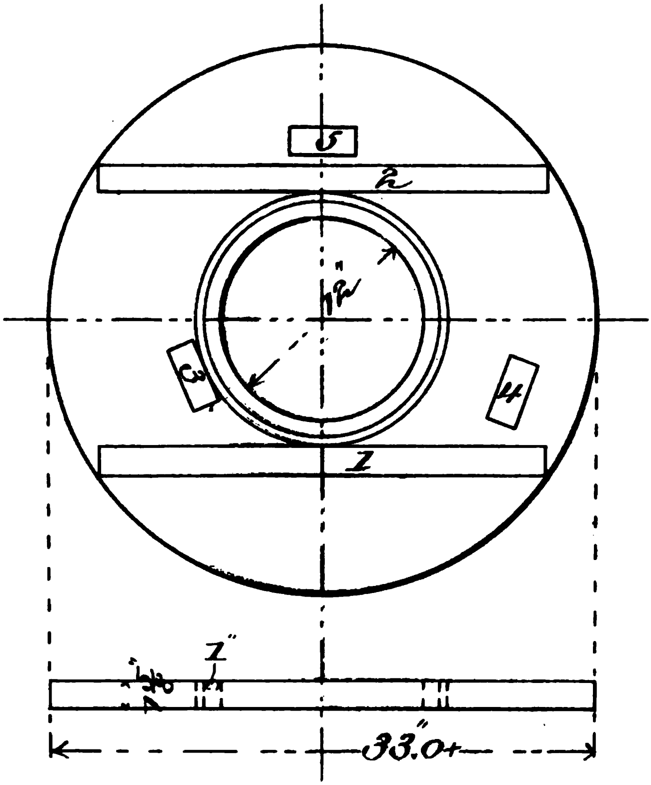
Breech end



12-inch B.L. Rifled Mortars

Cast iron Bodies

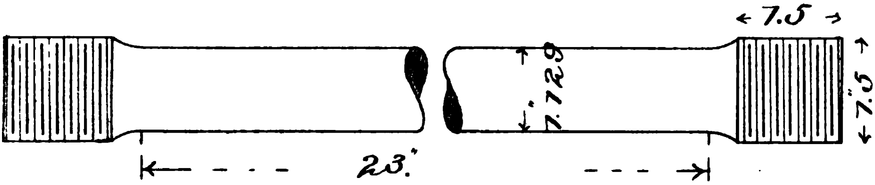
Muzzle end



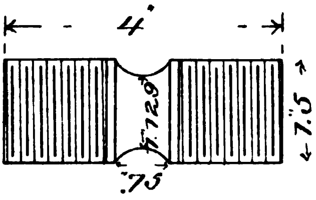
12-inch B.L. Rifled Mortars

Forms of specimens

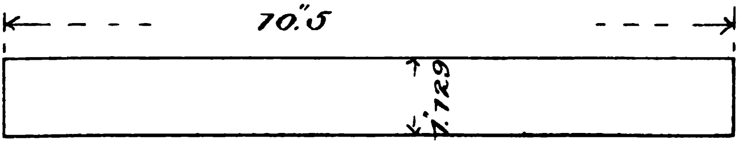
Tension



Tenacity



Compression



BODY No. 2 (second casting).

No. 4527.

Marks, $\overset{12\,\mathrm{M\,B_2\,T\,B_2}}{\mathrm{B\,T_{11}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000205	.000055	0.	....	
6,000	6,000	.000260	.000055	....	....	
7,000	7,000	.000315	.000055	....	....	
8,000	8,000	.000380	.000065	....	....	
9,000	9,000	.000450	.000070	....	....	
10,000	10,000	.000510	.000060	.000020	.000020	
11,000	11,000	.000580	.000070	....	....	
12,000	12,000	.000660	.000080	.000050	.000030	
13,000	13,000	.000750	.000090	....	....	
14,000	14,000	.000835	.000085	.000090	.000040	
15,000	15,000	.000920	.000085	....	....	
16,000	16,000	.001020	.000100	.000150	.000060	
17,000	17,000	.001145	.000125	....	....	
18,000	18,000	.001260	.000115	.000245	.000095	
19,000	19,000	.001420	.000160	....	....	
20,000	20,000	.001575	.000155	.000400	.000155	
21,000	21,000	.001790	.000215	....	....	
22,000	22,000	.002040	.000250	.000690	.000290	
23,000	23,000	.002325	.000285	....	....	
24,000	24,000	.002650	.000325	.001135	.000445	
25,000	25,000	.003140	.000490	....	....	Tensile strength.

Fractured 6 inches from neck. Appearance, uniform, granular.

No. 4528.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_1\,\mathrm{T}\,\mathrm{R}_1}_{\mathrm{M}\,\mathrm{T}_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000090	.000045	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000235	.000045	....	....	
7,000	7,000	.000285	.000050	....	....	
8,000	8,000	.000335	.000050	....	....	
9,000	9,000	.000385	.000050	....	....	
10,000	10,000	.000445	.000060	.000005	.000005	
11,000	11,000	.000500	.000055	....	....	
12,000	12,000	.000555	.000055	.000010	.000005	
13,000	13,000	.000625	.000070	....	....	
14,000	14,000	.000690	.000065	.000035	.000025	
15,000	15,000	.000750	.000060	....	....	
16,000	16,000	.000825	.000075	.000060	.000025	
17,000	17,000	.000900	.000075	....	....	
18,000	18,000	.000970	.000070	.000095	.000035	
19,000	19,000	.001060	.000090	....	....	
20,000	20,000	.001150	.000090	.000150	.000055	
21,000	21,000	.001255	.000105	....	....	
22,000	22,000	.001380	.000125	.000240	.000090	
23,000	23,000	.001500	.000120	....	....	
24,000	24,000	.001655	.000155	.000380	.000140	
25,000	25,000	.001850	.000195	.000500	.000120	
30,780	30,780	....	....	....	....	Tensile strength.

Fractured 1″ from neck. Appearance, uniform, granular.

No. 964.

Marks, $^{12\;M\;R_2\;T\;R_2}_{\qquad B\;T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006			
3,000	3,000	.00012	.00006			
4,000	4,000	.00016	.00004			
5,000	5,000	.00022	.00006	0.		
6,000	6,000	.00028	.00006			
7,000	7,000	.00032	.00004			
8,000	8,000	.00038	.00006			
9,000	9,000	.00044	.00006			
10,000	10,000	.00048	.00004			
11,000	11,000	.00054	.00006			
12,000	12,000	.00060	.00006			
13,000	13,000	.00066	.00006			
14,000	14,000	.00072	.00006			
15,000	15,000	.00078	.00006	.00004	.00004	
16,000	16,000	.00084	.00006			
17,000	17,000	.00090	.00006			
18,000	18,000	.00100	.00010			
19,000	19,000	.00106	.00006			
20,000	20,000	.00110	.00004	.00010	.00006	
21,000	21,000	.00120	.00010			
22,000	22,000	.00130	.00010			
23,000	23,000	.00136	.00006			
24,000	24,000	.00144	.00008			
25,000	25,000	.00154	.00010	.00026	.00016	
26,000	26,000	.00166	.00012			
27,000	27,000	.00176	.00010			
28,000	28,000	.00186	.00010			
29,000	29,000	.00198	.00012			
30,000	30,000	.00220	.00022	.00040	.00014	
31,000	31,000	.00232	.00012			
32,000	32,000	.00248	.00016			
33,000	33,000	.00270	.00022			
34,000	34,000	.00302	.00032			
35,000	35,000	.00340	.00038	.00156	.00116	
36,000	36,000	.00378	.00038			
37,000	37,000	.00410	.00032			
38,000	38,000	.00456	.00046			
39,000	39,000	.00500	.00044			
40,000	40,000	.00550	.00050	.00336	.00180	
41,000	41,000	.00600	.00050			
42,000	42,000	.00646	.00046			
43,000	43,000	.00710	.00064			
44,000	44,000	.00776	.00066			
45,000	45,000	.00856	.00080	.00600	.00264	
46,000	46,000	.00900	.00044			
47,000	47,000	.00958	.00058			
48,000	48,000	.01042	.00084			
49,000	49,000	.01154	.00112			
50,000	50,000	.01248	.00094	.00950	.00350	
59,280	59,280					Ultimate strength.

Failed by triple flexure.

No. 965.

Marks, $\frac{12\ M\ R_2\ T\ R_3}{B\ R_{20}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00072	.00008	....	....	
15,000	15,000	.00080	.00008	.00004	.00002	
16,000	16,000	.00084	.00004	....	....	
17,000	17,000	.00088	.00004	....	....	
18,000	18,000	.00092	.00004	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00104	.00006	.00008	.00004	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00118	.00008	....	....	
23,000	23,000	.00126	.00008	....	....	
24,000	24,000	.00136	.00010	....	....	
25,000	25,000	.00146	.00010	.00020	.00012	
26,000	26,000	.00158	.00012	....	....	
27,000	27,000	.00170	.00012	....	....	
28,000	28,000	.00182	.00012	....	....	
29,000	29,000	.00196	.00014	....	....	
30,000	30,000	.00212	.00016	.00062	.00042	
31,000	31,000	.00234	.00022	....	....	
32,000	32,000	.00256	.00022	....	....	
33,000	33,000	.00282	.00026	....	....	
34,000	34,000	.00310	.00028	....	....	
35,000	35,000	.00350	.00040	.00174	.00114	
36,000	36,000	.00380	.00030	....	....	
37,000	37,000	.00420	.00040	....	....	
38,000	38,000	.00466	.00046	....	....	
39,000	39,000	.00526	.00060	....	....	
40,000	40,000	.00570	.00044	.00360	.00186	
41,000	41,000	.00618	.00048	....	....	
42,000	42,000	.00670	.00052	....	....	
43,000	43,000	.00716	.00046	....	....	
44,000	44,000	.00778	.00062	....	....	
45,000	45,000	.00830	.00052	.00590	.00230	
46,000	46,000	.00884	.00054	....	....	
47,000	47,000	.00924	.00040	....	....	
48,000	48,000	.00974	.00050	....	....	
49,000	49,000	.01020	.00046	....	....	
50,000	50,000	.01060	.00040	.00794	.00204	
58,470	58,470	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 966.

Marks, $\frac{12\ M\ R_2\ T\ B_1}{M\ T_{13}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00050	.00008	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	12,000	.00062	.00006	....	....	
14,000	14,000	.00068	.00006	....	....	
15,000	15,000	.00076	.00008	.00006	.00004	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00084	.00004	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00098	.00008	....	....	
20,000	20,000	.00102	.00004	.00012	.00006	
21,000	21,000	.00108	.00006	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00120	.00006	....	....	
24,000	24,000	.00130	.00010	....	....	
25,000	25,000	.00136	.00006	.00020	.00008	
26,000	26,000	.00144	.00008	....	....	
27,000	27,000	.00152	.00008	....	....	
28,000	28,000	.00160	.00008	....	....	
29,000	29,000	.00170	.00010	....	....	
30,000	30,000	.00180	.00010	.00040	.00020	
31,000	31,000	.00192	.00012	....	....	
32,000	32,000	.00202	.00010	....	....	
33,000	33,000	.00216	.00014	....	....	
34,000	34,000	.00234	.00018	....	....	
35,000	35,000	.00254	.00020	.00082	.00042	
36,000	36,000	.00280	.00026	....	....	
37,000	37,000	.00302	.00022	....	....	
38,000	38,000	.00330	.00028	....	....	
39,000	39,000	.00358	.00028	....	....	
40,000	40,000	.00400	.00042	.00200	.00118	
41,000	41,000	.00440	.00040	....	....	
42,000	42,000	.00464	.00024	....	....	
43,000	43,000	.00500	.00036	....	....	
44,000	44,000	.00550	.00050	....	....	
45,000	45,000	.00590	.00040	.00360	.00160	
46,000	46,000	.00636	.00046	....	....	
47,000	47,000	.00678	.00042	....	....	
48,000	48,000	.00718	.00040	....	....	
49,000	49,000	.00746	.00028	....	....	
50,000	50,000	.00780	.00034	.00530	.00170	
60,870	60,870	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 4.

No. 4529.

Marks, $\genfrac{}{}{0pt}{}{12\,\text{M}\,\text{R}_4\,\text{T}\,\text{R}_2}{\text{B}\,\text{T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000205	.000055	.000005	.000005	
6,000	6,000	.000260	.000055	....	....	
7,000	7,000	.000315	.000055	....	....	
8,000	8,000	.000380	.000065	....	....	
9,000	9,000	.000445	.000065	....	....	
10,000	10,000	.000505	.000060	.000035	.000030	
11,000	11,000	.000575	.000070	....	....	
12,000	12,000	.000645	.000070	.000050	.000015	
13,000	13,000	.000720	.000075	....	....	
14,000	14,000	.000795	.000075	.000085	.000035	
15,000	15,000	.000880	.000085	....	....	
16,000	16,000	.000960	.000080	.000130	.000045	
17,000	17,000	.001055	.000095	....	....	
18,000	18,000	.001160	.000105	.000195	.000065	
19,000	19,000	.001295	.000135	....	....	
20,000	20,000	.001415	.000120	.000305	.000110	
21,000	21,000	.001595	.000180	....	....	
22,000	22,000	.001775	.000180	.000505	.000200	
23,000	23,000	.002010	.000235	....	....	
24,000	24,000	.002285	.000275	.000845	.000340	
24,930	24,930	....	....	....	....	Tensile strength.

Fractured 6″ from neck. Appearance, uniform, granular.

No. 4530.

Marks, $^{12\,\text{M R}_1\,\text{T R}_1}_{\quad\text{M T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000355	.000055	....	....	
9,000	9,000	.000405	.000050	....	....	
10,000	10,000	.000465	.000060	.000005	.000005	
11,000	11,000	.000540	.000075	....	....	
12,000	12,000	.000595	.000055	.000035	.000030	
13,000	13,000	.000655	.000060	....	....	
14,000	14,000	.000710	.000055	.000050	.000015	
15,000	15,000	.000795	.000085	....	....	
16,000	16,000	.000860	.000065	.000065	.000015	
17,000	17,000	.000940	.000080	....	....	
18,000	18,000	.001010	.000070	.000110	.000045	
19,000	19,000	.001110	.000100	....	....	
20,000	20,000	.001205	.000095	.000180	.000070	
21,000	21,000	.001310	.000105	....	....	
22,000	22,000	.001435	.000125	.000260	.000080	
23,000	23,000	.001575	.000140	....	....	
24,000	24,000	.001740	.000165	.000450	.000190	
25,000	25,000	.001935	.000195	.000565	.000115	
26,410	26,410	....	....	....	....	Tensile strength.

Fractured 1.″5 from middle of stem. Appearance, uniform, granular.

No. 967.

Marks, $12\,M\,\underset{B\,T_2}{R_1}\,T\,R_2$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00005	.00005	....	....	
3,000	3,000	.00010	.00005	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9,000	.00036	.00006	....	....	
10,000	10,000	.00040	.00004	0.	....	
11,000	11,000	.00046	.00006	....	....	
12,000	12,000	.00050	.00004	....	....	
13,000	13,000	.00056	.00006	....	....	
14,000	14,000	.00060	.00004	....	....	
15,000	15,000	.00066	.00006	0.	....	
16,000	16,000	.00074	.00008	....	....	
17,000	17,000	.00076	.00002	....	....	
18,000	18,000	.00082	.00006	....	....	
19,000	19,000	.00086	.00004	....	....	
20,000	20,000	.00094	.00008	.00002	.00002	
21,000	21,000	.00104	.00010	....	....	
22,000	22,000	.00108	.00004	....	....	
23,000	23,000	.00114	.00006	....	....	
24,000	24,000	.00120	.00006	....	....	
25,000	25,000	.00124	.00004	.00006	.00004	
26,000	26,000	.00132	.00008	....	....	
27,000	27,000	.00144	.00012	....	....	
28,000	28,000	.00152	.00008	....	....	
29,000	29,000	.00166	.00014	....	....	
30,000	30,000	.00176	.00010	.00028	.00022	
31,000	31,000	.00196	.00020	....	....	
32,000	32,000	.00210	.00014	....	....	
33,000	33,000	.00234	.00024	....	....	
34,000	34,000	.00256	.00022	....	....	
35,000	35,000	.00290	.00034	.00114	.00086	
36,000	36,000	.00310	.00020	....	....	
37,000	37,000	.00340	.00030	....	....	
38,000	38,000	.00376	.00036	....	....	
39,000	39,000	.00424	.00048	....	....	
40,000	40,000	.00476	.00052	.00270	.00156	
41,000	41,000	.00516	.00040	....	....	
42,000	42,000	.00546	.00030	....	....	
43,000	43,000	.00602	.00056	....	....	
44,000	44,000	.00664	.00062	....	....	
45,000	45,000	.00704	.00040	.000470	.00200	
46,000	46,000	.00756	.00052	....	....	
47,000	47,000	.00796	.00040	....	....	
48,000	48,000	.00850	.00054	....	....	
49,000	49,000	.00898	.00048	....	....	
50,000	50,000	.00968	.00070	.00700	.00230	
63,100	63,100	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 968.

Marks, $\overset{12\ M\ R_4\ T\ R_2}{B\ R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00008	.00008	....	....	
3,000	3,000	.00012	.00004	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00020	.00004	.00004	.00004	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00036	.00004	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00048	.00006	.00006	.00002	
11,000	11,000	.00054	.00006	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00070	.00004	....	....	
15,000	15,000	.00076	.00006	.00010	.00004	
16,000	16,000	.00082	.00006	....	....	
17,000	17,000	.00088	.00006	....	....	
18,000	18,000	.00096	.00008	....	....	
19,000	19,000	.00100	.00004	....	....	
20,000	20,000	.00108	.00008	.00016	.00006	
21,000	21,000	.00116	.00008	....	....	
22,000	22,000	.00122	.00006	....	....	
23,000	23,000	.00130	.00008	....	....	
24,000	24,000	.00138	.00008	....	....	
25,000	25,000	.00146	.00008	.00026	.00010	
26,000	26,000	.00154	.00008	....	....	
27,000	27,000	.00160	.00006	....	....	
28,000	28.000	.00170	.00010	....	....	
29,000	29,000	.00188	.00018	....	....	
30,000	30,000	.00200	.00012	.00056	.00030	
31,000	31,000	.00216	.00016	....	....	
32.000	32,000	.00240	.00024	....	....	
33,000	33,000	.00260	.00020	....	....	
34,000	34,000	.00292	.00032	....	....	
35,000	35,000	.00330	.00038	.00154	.00098	
36,000	36,000	.00366	.00036	....	....	
37,000	37,000	.00400	.00034	....	....	
38,000	38,000	.00442	.00042	....	....	
39,000	39,000	.00480	.00038	....	....	
40,000	40,000	.00530	.00050	.00330	.00176	
41,000	41,000	.00596	.00066	....	....	
42,000	42,000	.00630	.00034	....	....	
43,000	43,000	.00692	.00062	....	....	
44,000	44,000	.00760	.00068	....	....	
45,000	45,000	.00820	.00060	.00576	.00246	
46,000	46,000	.00870	.00050	....	....	
47,000	47,000	.00940	.00070	....	....	
48,000	48,000	.01006	.00066	....	....	
49,000	49,000	.01100	.00094	....	....	
50,000	50,000	.01218	.00118	.00938	.00362	
60,100	60,100	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 969.

Marks, $^{12}\mathrm{M\,R_4\,T\,R_1}_{\mathrm{M\,T_2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	0.	...	
3,000	3,000	.00010	.00004	...	...	
4,000	4,000	.00014	.00004	...	...	
5,000	5,000	.00016	.00002	—.00004	—.00004	
6,000	6,000	.00020	.00004	...	...	
7,000	7,000	.00024	.00004	...	...	
8,000	8,000	.00030	.00006	...	...	
9,000	9,000	.00036	.00006	...	...	
10,000	10,000	.00040	.00004	0.	.00004	
11,000	11,000	.00044	.00004	...	...	
12,000	12,000	.00048	.00004	...	...	
13,000	13,000	.00054	.00006	...	...	
14,000	14,000	.00060	.00006	...	...	
15,000	15,000	.00068	.00008	0.	...	
16,000	16,000	.00072	.00004	...	...	
17,000	17,000	.00076	.00004	...	...	
18,000	18,000	.00080	.00004	...	...	
19,000	19,000	.00086	.00006	...	...	
20,000	20,000	.00094	.00008	0.	...	
21,000	21,000	.00100	.00006	...	...	
22,000	22,000	.00106	.00006	...	...	
23,000	23,000	.00114	.00008	...	...	
24,000	24,000	.00122	.00008	...	...	
25,000	25,000	.00130	.00008	.00010	.00010	
26,000	26,000	.00134	.00004	...	...	
27,000	27,000	.00140	.00006	...	...	
28,000	28,000	.00150	.00010	...	...	
29,000	29,000	.00162	.00012	...	...	
30,000	30,000	.00172	.00010	.00028	.00018	
31,000	31,000	.00184	.00012	...	...	
32,000	32,000	.00196	.00012	...	...	
33,000	33,000	.00216	.00020	...	...	
34,000	34,000	.00236	.00020	...	...	
35,000	35,000	.00266	.00030	.00090	.00062	
36,000	36,000	.00296	.00030	...	...	
37,000	37,000	.00320	.00024	...	...	
38,000	38,000	.00358	.00038	...	...	
39,000	39,000	.00406	.00048	...	...	
40,000	40,000	.00440	.00034	.00234	.00144	
41,000	41,000	.00492	.00052	...	...	
42,000	42,000	.00544	.00052	...	...	
43,000	43,000	.00606	.00062	...	...	
44,000	44,000	.00660	.00054	...	...	
45,000	45,000	.00730	.00070	.00490	.00256	
46,000	46,000	.00802	.00072	...	...	
47,000	47,000	.00862	.00060	...	...	
48,000	48,000	.00932	.00070	...	...	
49,000	49,000	.01034	.00102	...	...	
50,000	50,000	.01152	.00118	.00866	.00376	
60,480	60,480	...	...	...	...	Ultimate strength.

Failed by triple flexure.

BODY No. 5.

No. 4531.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_3\,\mathrm{T}\,\mathrm{R}_2}_{\quad\mathrm{B}\,\mathrm{T}_1}$
Diameter, 1.″129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	.000005	.000005	
6,000	6,000	.000255	.000055	....	....	
7,000	7,000	.000310	.000055	....	....	
8,000	8,000	.000375	.000065	....	....	
9,000	9,000	.000435	.000060	....	....	
10,000	10,000	.000495	.000060	.000035	.000030	
11,000	11,000	.000550	.000055	....	....	
12,000	12,000	.000615	.000065	.000055	.000020	
13,000	13,000	.000685	.000070	....	....	
14,000	14,000	.000755	.000070	.000080	.000025	
15,000	15,000	.000825	.000070	....	....	
16,000	16,000	.000905	.000080	.000100	.000020	
17,000	17,000	.000990	.000085	....	....	
18,000	18,000	.001080	.000090	.000140	.000040	
19,000	19,000	.001190	.000110	....	....	
20,000	20,000	.001300	.000110	.000250	,000110	
21,000	21,000	.001460	.000160	....	....	
22,000	22,000	.001625	.000165	.000420	.000170	
23,000	23,000	.001855	.000230	....	....	
24,000	24,000	.002055	.000200	.000695	.000275	
25,000	25,000	.002400	.000345	.000940	.000245	Tensile strength.

Fractured 11″ from neck. Appearance, granular, mottled.

No. 4532.

Marks, 12 M R, T R, M T,
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000405	.000055	....	....	
10,000	10,000	.000460	.000055	.000010	.000010	
11,000	11,000	.000515	.000055	....	....	
12,000	12,000	.000575	.000060	.000030	.000020	
13,000	13,000	.000640	.000065	....	....	
14,000	14,000	.000700	.000060	.000045	.000015	
15,000	15,000	.000765	.000065	....	....	
16,000	16,000	.000825	.000060	.000055	.000010	
17,000	17,000	.000875	.000050	....	....	
18,000	18,000	.000935	.000060	.000060	.000605	
19,000	19,000	.001005	.000070	....	....	
20,000	20,000	.001085	.000080	.000080	.000020	
21,000	21,000	.001160	.000075	....	....	
22,000	22,000	.001270	.000110	.000120	.000040	
23,000	23,000	.001385	.000115	....	....	
24,000	24,000	.001495	.000110	.000210	.000090	
25,000	25,000	.001660	.000165	.000310	.000100	
27,320	27,320	....	....	....	....	Tensile strength.

Fractured 5″.7 from neck. Appearance, granular, mottled.

No. 970.

Marks, 12 M R, T R, B T,
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00005	.00005	....	....	
3,000	3,000	.00010	.00005	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00006	.00006	
11,000	11,000	.00054	.00008	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00074	.00008	....	....	
15,000	15,000	.00080	.00006	.00010	.00004	
16,000	16,000	.00086	.00006	....	....	
17,000	17,000	.00092	.00006	....	....	
18,000	18,000	.00098	.00006	....	....	
19,000	19,000	.00104	.00006	....	....	
20,000	20,000	.00110	.00006	.00016	.00006	
21,000	21,000	.00116	.00006	....	....	
22,000	22,000	.00122	.00006	....	....	
23,000	23,000	.00128	.00006	....	....	
24,000	24,000	.00138	.00010	....	....	
25,000	25,000	.00144	.00006	.00026	.00010	
26,000	26,000	.00154	.00010	....	....	
27,000	27,000	.00162	.00008	....	....	
28,000	28,000	.00170	.00008	....	....	
29,000	29,000	.00184	.00014	....	....	
30,000	30,000	.00196	.00012	.00052	.00026	
31,000	31,000	.00216	.00020	....	....	
32,000	32,000	.00230	.00014	....	....	
33,000	33,000	.00246	.00016	....	....	
34,000	34,000	.00270	.00024	....	....	
35,000	35,000	.00292	.00022	.00120	.00068	
36,000	36,000	.00332	.00040	....	....	
37,000	37,000	.00352	.00020	....	....	
38,000	38,000	.00380	.00028	....	....	
39,000	39,000	.00420	.00040	....	....	
40,000	40,000	.00464	.00044	.00264	.00144	
41,000	41,000	.00514	.00050	....	....	
42,000	42,000	.00546	.00032	....	....	
43,000	43,000	.00600	.00054	....	....	
44,000	44,000	.00650	.00050	....	....	
45,000	45,000	.00698	.00048	.00470	.00206	
46,000	46,000	.00744	.00046	....	....	
47,000	47,000	.00800	.00056	....	....	
48,000	48,000	.00842	.00042	....	....	
49,000	49,000	.00880	.00038	....	....	
50,000	50,000	.00922	.00042	.00668	.00198	
63,200	63,200	....	....	....	....	Ultimate strength.

Failed by triple flexure

No. 971.

Marks $^{12\,\mathrm{M}\,\mathrm{R}_4\,\mathrm{T}\,\mathrm{R}_2}_{\mathrm{B}\,\mathrm{R}_{10}}$
Length, 10″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00036	.00004	....	....	
9,000	9,000	.00040	.00004	....	....	
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00058	.00008	....	....	
13,000	13,000	.00066	.00008	....	....	
14,000	14,000	.00070	.00004	....	....	
15,000	15,000	.00076	.00006	.00004	.00002	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00084	.00004	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00102	.00006	.00010	.00006	
21,000	21,000	.00110	.00008	....	....	
22,000	22,000	.00118	.00008	....	....	
23,000	23,000	.00126	.00008	....	....	
24,000	24,000	.00130	.00004	....	....	
25,000	25,000	.00140	.00010	.00020	.00010	
26,000	26,000	.00150	.00010	....	....	
27,000	27,000	.00158	.00008	....	....	
28,000	28,000	.00168	.00010	....	....	
29,000	29,000	.00180	.00012	....	....	
30,000	30,000	.00196	.00016	.00050	.00030	
31,000	31,000	.00208	.00012	....	....	
32,000	32,000	.00224	.00016	....	....	
33,000	33,000	.00246	.00022	....	....	
34,000	34,000	.00274	.00028	....	....	
35,000	35,000	.00314	.00040	.00140	.00090	
36,000	36,000	.00350	.00036	....	....	
37,000	37,000	.00382	.00032	....	....	
38,000	38,000	.00422	.00040	....	....	
39,000	39,000	.00466	.00044	....	....	
40,000	40,000	.00506	.00040	.00304	.00160	
41,000	41,000	.00556	.00050	....	....	
42,000	42,000	.00600	.00044	....	....	
43,000	43,000	.00650	.00050	....	....	
44,000	44,000	.00710	.00060	....	....	
45,000	45,000	.00760	.00050	.00530	.00226	
46,000	46,000	.00818	.00058	....	....	
47,000	47,000	.00854	.00036	....	....	
48,000	48,000	.00920	.00066	....	....	
49,000	49,000	.00990	.00070	....	....	
50,000	50,000	.01078	.00088	.00812	.00282	
62,800	62,800	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 972.

Marks, $^{12\ \mathrm{M\ R_1\ T\ B_1}}_{\ \ \mathrm{M\ T_2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00040	.00004	....	....	
10,000	10,000	.00042	.00002	.00002	.00002	
11,000	11,000	.00046	.00004	....	....	
12,000	12,000	.00050	.00004	....	....	
13,000	13,000	.00056	.00006	....	....	
14,000	14,000	.00062	.00006	....	....	
15,000	15,000	.00070	.00008	.00004	.00002	
16,000	16,000	.00074	.00004	....	....	
17,000	17,000	.00078	.00004	....	....	
18,000	18,000	.00084	.00006	....	....	
19,000	19,000	.00090	.00006	....	....	
20,000	20,000	.00096	.00006	.00006	.00002	
21,000	21,000	.00100	.00004	....	....	
22,000	22,000	.00106	.00006	....	....	
23,000	23,000	.00110	.00004	....	....	
24,000	24,000	.00116	.00006	....	....	
25,000	25,000	.00124	.00008	.00010	.00004	
26,000	26,000	.00130	.00006	....	....	
27,000	27,000	.00136	.00006	....	....	
28,000	28,000	.00142	.00006	....	....	
29,000	29,000	.00150	.00008	....	....	
30,000	30,000	.00156	.00006	.00018	.00008	
31,000	31,000	.00162	.00006	....	....	
32,000	32,000	.00170	.00008	....	....	
33,000	33,000	.00180	.00010	....	....	
34,000	34,000	.00188	.00008	....	....	
35,000	35,000	.00200	.00012	.00040	.00022	
36,000	36,000	.00210	.00010	....	....	
37,000	37,000	.00222	.00012	....	....	
38,000	38,000	.00238	.00016	....	....	
39,000	39,000	.00256	.00018	....	....	
40,000	40,000	.00270	.00014	.00080	.00040	
41,000	41,000	.00296	.00026	....	....	
42,000	42,000	.00322	.00026	....	....	
43,000	43,000	.00352	.00030	....	....	
44,000	44,000	.00388	.00036	....	....	
45,000	45,000	.00424	.00036	.00206	.00126	
46,000	46,000	.00460	.00036	....	....	
47,000	47,000	.00500	.00040	....	....	
48,000	48,000	.00534	.00034	....	....	
49,000	49,000	.00580	.00046	....	....	
50,000	50,000	.00616	.00036	.00370	.00164	
65,900	65,900	....	....	....	....	Ultimate strength.

Failed by triple flexure,

BODY No. 6.

No. 4573.

Marks, $\underset{\mathrm{B\,T_1}}{\mathrm{12\,M\,R_4\,T\,R_2}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	8,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000260	.000060	....	....	
7,000	7,000	.000310	.000050	....	....	
8,000	8,000	.000375	.000065	....	....	
9,000	9,000	.000430	.000055	....	....	
10,000	10,000	.000500	.000070	.000015	.000015	
11,000	11,000	.000560	.000060	....	....	
12,000	12,000	.000635	.000075	.000045	.000030	
13,000	13,000	.000710	.000075	....	....	
14,000	14,000	.000785	.000075	.000085	.000040	
15,000	15,000	.000860	.000075	....	....	
16,000	16,000	.000950	.000090	.000110	.000025	
17,000	17,000	.001050	.000100	....	....	
18,000	18,000	.001155	.000105	.000190	.000080	
19,000	19,000	.001270	.000115	....	....	
20,000	20,000	.001405	.000135	.000300	.000110	
21,000	21,000	.001585	.000180	....	....	
22,000	22,000	.001760	.000175	.000505	.000205	
23,000	23,000	.001990	.000230	....	....	
24,000	24,000	.002240	.000250	.000835	.000330	
25,590	25,590	....	....	....	....	Tensile strength.

Fractured 5″.2 from neck. Appearance, uniform, granular.

No. 4574.

Marks, $^{12\,M\,R_1\,T\,R_1}_{\quad M\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000400	.000050	....	....	
10,000	10,000	.000450	.000050	.000015	.000015	
11,000	11,000	.000510	.000060	....	....	
12,000	12,000	.000570	.000060	.000040	.000025	
13,000	13,000	.000640	.000070	....	....	
14,000	14,000	.000705	.000065	.000055	.000015	
15,000	15,000	.000780	.000075	....	....	
16,000	16,000	.000850	.000070	.000095	.000040	
17,000	17,000	.000940	.000090	....	....	
18,000	18,000	.001020	.000080	.000145	.000050	
19,000	19,000	.001120	.000100	....	....	
20,000	20,000	.001230	.000110	.000235	.000090	
21,000	21,000	.001370	.000140	....	....	
22,000	22,000	.001510	.000140	.000380	.000145	
23,000	23,000	.001700	.000190	....	....	
24,000	24,000	.001900	.000200	.000610	.000230	
25,000	25,000	.002200	.000300	.000845	.000235	
28,390	28,390	....	....	....	....	Tensile strength.

Fractured 2″ from neck. Appearance. uniform, granular.

No. 977.

Marks, $^{12\text{ M R, T R,}}_{\text{B T,}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00058	.00008	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00006	.00004	
16,000	16,000	.00082	.00006	....	....	
17,000	17,000	.00088	.00006	....	....	
18,000	18,000	.00094	.00006	....	....	
19,000	19,000	.00102	.00008	....	....	
20,000	20,000	.00108	.00006	.00012	.00006	
21,000	21,000	.00114	.00006	....	....	
22,000	22,000	.00122	.00008	....	....	
23,000	23,000	.00128	.00006	....	....	
24,000	24,000	.00138	.00010	....	....	
25,000	25,000	.00144	.00006	.00022	.00010	
26,000	26,000	.00158	.00014	....	....	
27,000	27,000	.00168	.00010	....	....	
28,000	28,000	.00176	.00008	....	....	
29,000	29,000	.00190	.00014	....	....	
30,000	30,000	.00204	.00014	.00062	.00040	
31,000	31,000	.00222	.00018	....	....	
32,000	32,000	.00242	.00020	....	....	
33,000	33,000	.00260	.00018	....	....	
34,000	34,000	.00286	.00026	....	....	
35,000	35,000	.00322	.00036	.00152	.00090	
36,000	36,000	.00354	.00032	....	....	
37,000	37,000	.00400	.00046	....	....	
38,000	38,000	.00438	.00038	....	....	
39,000	39,000	.00480	.00042	....	....	
40,000	40,000	.00540	.00060	.00338	.00186	
41,000	41,000	.00584	.00044	....	....	
42,000	42,000	.00632	.00048	....	....	
43,000	43,000	.00678	.00046	....	....	
44,000	44,000	.00738	.00060	....	....	
45,000	45,000	.00808	.00070	.00570	.00232	
46,000	46,000	.00848	.00040	....	....	
47,000	47,000	.00910	.00062	....	....	
48,000	48,000	.00980	.00070	....	....	
49,000	49,000	.01050	.00070	....	....	
50,000	50,000	.01150	.00100	.00880	.00310	
61,200	61,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 978.

Marks, $\begin{matrix}\mathrm{^{12}M\,R_6\,T\,R_2}\\ \mathrm{B\,R_{10}}\end{matrix}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00052	.00008	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00006	.00004	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,060	.00092	.00006	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00104	.00006	.00006	0.	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00116	.00006	....	....	
23,000	23,000	.00124	.00008	....	....	
24,000	24,000	.00132	.00008	....	....	
25,000	25,000	.00142	.00010	.00020	.00014	
26,000	26,000	.00152	.00010	....	....	
27,000	27,000	.00162	.00010	....	....	
28,000	28,000	.00174	.00012	....	....	
29,000	29,000	.00186	.00012	....	....	
30,000	30,000	.00200	.00014	.00056	.00036	
31,000	31,000	.00218	.00018	....	....	
32,000	32,000	.00236	.00018	....	....	
33,000	33,000	.00260	.00024	....	....	
34,000	34,000	.00290	.00030	....	....	
35,000	35,000	.00320	.00030	.00150	.00094	
36,000	36,000	.00354	.00034	....	....	
37,000	37,000	.00384	.00030	....	....	
38,000	38,000	.00438	.00054	....	....	
39,000	39,000	.00482	.00044	....	....	
40,000	40,000	.00536	.00054	.00338	.00188	
41,000	41,000	.00576	.00040	....	....	
42,000	42,000	.00624	.00048	....	....	
43,000	43,000	.00670	.00046	....	....	
44,000	44,000	.00724	.00054	....	....	
45,000	45,000	.00774	.00050	.00548	.00210	
46,000	46,000	.00832	.00058	....	....	
47,000	47,000	.00872	.00040	....	....	
48,000	48,000	.00914	.00042	....	....	
49,000	49,000	.00944	.00030	....	....	
50,000	50,000	.00968	.00024	.00718	.00170	
60,200	60,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 979.

Marks, $\overset{12\,\mathrm{M\,R_4\,T\,R_1}}{\mathrm{M\,T_3}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00018	.00006	....	....	
5,000	5,000	.00024	.00006	0.	....	
6,000	6,000	.00026	.00002	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00046	.00004	0.	....	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00004	.00004	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00094	.00008	....	....	
19,000	19,000	.00100	.00006	....	....	
20,000	20,000	.00108	.00008	.00008	.00004	
21,000	21,000	.00114	.00006	....	....	
22,000	22,000	.00122	.00008	....	....	
23,000	23,000	.00130	.00008	....	....	
24,000	24,000	.00136	.00006	....	....	
25,000	25,000	.00146	.00010	.00020	.00012	
26,000	26,000	.00156	.00010	....	....	
27,000	27,000	.00166	.00010	....	....	
28,000	28,000	.00176	.00010	....	....	
29,000	29,000	.00194	.00018	....	....	
30,000	30,000	.00216	.00022	.00062	.00042	
31,000	31,000	.00236	.00020	....	....	
32,000	32,000	.00256	.00020	....	....	
33,000	33,000	.00278	.00022	....	....	
34,000	34,000	.00302	.00024	....	....	
35,000	35,000	.00350	.00048	.00170	.00108	
36,000	36 000	.00380	.00030	....	....	
37,000	37,000	.00414	.00034	....	....	
38,000	38,000	.00454	.00040	....	....	
39,000	39,000	.00488	.00034	....	....	
40,000	40,000	.00560	.00072	.00360	.00190	
41,000	41,000	.00634	.00074	....	....	
42,000	42,000	.00674	.00040	....	....	
43,000	43,000	.00722	.00048	....	....	
44,000	44,000	.00784	.00062	....	....	
45,000	45,000	.00840	.00056	.00620	.00260	
46,000	46,000	.00920	.00080	....	....	
47,000	47,000	.00990	.00070	....	....	
48,000	48,000	.01064	.00074	....	....	
49,000	49,000	.01166	.00102	....	....	
50,000	50,000	.01280	.00114	.01000	.00380	
59,300	59,300	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 7.

No. 4575.

Marks, 12 M R, T R, B T,
Diameter, 1".129.
Sectional area, 1 square inch.
Length of stem, 23".
Gauged length, 20".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000040	.000040	....	....	
3,000	3,000	.000090	.000050	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000240	.000050	....	....	
7,000	7,000	.000290	.000050	....	....	
8,000	8,000	.000345	.000055	....	....	
9,000	9,000	.000400	.000055	....	....	
10,000	10,000	.000455	.000055	.000015	.000015	
11,000	11,000	.000515	.000060	....	....	
12,000	12,000	.000570	.000055	.000035	.000020	
13,000	13,000	.000640	.000070	....	....	
14,000	14,000	.000705	.000065	.000055	.000020	
15,000	15,000	.000780	.000075	....	....	
16,000	16,000	.000850	.000070	.000085	.000030	
17,000	17,000	.000930	.000080	....	....	
18,000	18,000	.001005	.000075	.000140	.000055	
19,000	19,000	.001100	.000095	....	....	
20,000	20,000	.001200	.000100	.000205	.000065	
21,000	21,000	.001325	.000125	....	....	
22,000	22,000	.001440	.000115	.000320	.000115	
23,000	23,000	.001610	.000170	....	....	
24,000	24,000	.001775	.000165	.000515	.000195	
25,000	25,000	.002000	.000225	.000670	.000155	
30,590	30,590	....	....	....	....	Tensile strength.

Fractured 4".2 from neck. Appearance, medium fine granular.

No. 4576.

Marks, $^{12}\substack{M\;R_7\;T\;R_1\\ M\;T_1}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000040	.000040	....	....	
3,000	3,000	.000085	.000045	....	....	
4,000	4,000	.000135	.000050	....	....	
5,000	5,000	.000180	.000045	0.	....	
6,000	6,000	.000235	.000055	....	....	
7,000	7,000	.000285	.000050	....	....	
8,000	8,000	.000335	.000050	....	....	
9,000	9,000	.000385	.000050	....	....	
10,000	10,000	.000445	.000060	.000005	.000005	
11,000	11,000	.000500	.000055	....	....	
12,000	12,000	.000560	.000060	.000030	.000025	
13,000	13,000	.000630	.000070	....	....	
14,000	14,000	.000695	.000065	.000055	.000025	
15,000	15,000	.000760	.000065	....	....	
16,000	16,000	.000845	.000085	.000100	.000045	
17,000	17,000	.000915	.000070	....	....	
18,000	18,000	.001010	.000095	.000150	.000050	
19,000	19,000	.001105	.000095	....	....	
20,000	20,000	.001230	.000125	.000250	.000100	
21,000	21,000	.001360	.000130	....	....	
22,000	22,000	.001510	.000150	.000400	.000150	
23,000	23,000	.001745	.000235	....	....	
24,000	24,000	.001950	.000205	.000700	.000300	
25,000	25,000	.002290	.000340	.000955	.000255	
27,640	27,640	....	....	....	....	Tensile strength.

Fractured 1'' from neck. Appearance, granular, mottled.

No. 980.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_7\,\mathrm{T}\,\mathrm{R}_1}_{\quad\;\;\mathrm{B}\,\mathrm{T}_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00020	.00004	....	....	
7,000	7,000	.00026	.00006	....	....	
8,000	8,000	.00032	.00006	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	0.	....	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00068	.00004	.00004	.00004	
16,000	16,000	.00076	.00008	....	....	
17,000	17,000	.00080	.00004	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00098	.00006	.00006	.00002	
21,000	21,000	.00106	.00008	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00134	.00006	.00020	.00014	
26,000	26,000	.00146	.00012	....	....	
27,000	27,000	.00156	.00010	....	....	
28,000	28,000	.00166	.00010	....	....	
29,000	29,000	.00178	.00012	....	....	
30,000	30,000	.00192	.00014	.00050	.00030	
31,000	31,000	.00204	.00012	....	....	
32,000	32,000	.00222	.00018	....	....	
33,000	33,000	.00246	.00024	....	....	
34,000	34,000	.00268	.00022	....	....	
35,000	35,000	.00294	.00026	.00130	.00080	
36,000	36,000	.00334	.00040	....	....	
37,000	37,000	.00362	.00028	....	....	
38,000	38,000	.00396	.00034	....	....	
39,000	39,000	.00440	.00044	....	....	
40,000	40,000	.00490	.00050	.00290	.00160	
41,000	41,000	.00542	.00052	....	....	
42,000	42,000	.00588	.00046	....	....	
43,000	43,000	.00640	.00052	....	....	
44,000	44,000	.00690	.00050	....	....	
45,000	45,000	.00760	.00070	.00538	.00248	
46,000	46,000	.00820	.00060	....	....	
47,000	47,000	.00868	.00048	....	....	
48,000	48,000	.00926	.00058	....	....	
49,000	49,000	.00994	.00068	....	....	
50,000	50,000	.01070	.00076	.00820	.00282	
61,800	61,800	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 981.

Marks, $\substack{\text{12 M R}_7\text{ T R}_3 \\ \text{B R}_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00018	.00006	....	....	
5,000	5,000	.00022	.00004	0.	....	
6,000	6,000	.00026	.00004	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00001	.00001	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00070	.00004	.00006	.00005	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00084	.00008	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00100	.00004	.00010	.00004	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00114	.00008	....	....	
23,000	23,000	.00120	.00006	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00136	.00008	.00020	.00010	
26,000	26,000	.00146	.00010	....	....	
27,000	27,000	.00152	.00006	....	....	
28,000	28,000	.00162	.00010	....	....	
29,000	29,000	.00174	.00012	....	....	
30,000	30,000	.00190	.00016	.00050	.00030	
31,000	31,000	.00202	.00012	....	....	
32,000	32,000	.00222	.00020	....	....	
33,000	33,000	.00244	.00022	....	....	
34,000	34,000	.00270	.00026	....	....	
35,000	35,000	.00296	.00026	.00130	.00080	
36,000	36,000	.00336	.00040	....	....	
37,000	37,000	.00366	.00030	....	....	
38,000	38,000	.00402	.00036	....	....	
39,000	39,000	.00454	.00052	....	....	
40,000	40,000	.00512	.00058	.00316	.00186	
41,000	41,000	.00548	.00036	....	....	
42,000	42,000	.00598	.00050	....	....	
43,000	43,000	.00660	.00062	....	....	
44,000	44,000	.00716	.00056	....	....	
45,000	45,000	.00784	.00068	.00562	.00246	
46,000	46,000	.00836	.00052	....	....	
47,000	47,000	.00860	.00024	....	....	
48,000	48,000	.00910	.00050	....	....	
49,000	49,000	.00978	.00068	....	....	
50,000	50,000	.01046	.00068	.00800	.00238	
60,580	60,580	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 982.

Marks, $\substack{12\ \mathrm{M\ R_1\ T\ R_1}\\ \mathrm{M\ T_2}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00022	.00006	.0	....	
6,000	6,000	.00026	.00004	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00052	.00004	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00078	.00008	.00004	.00002	
16,000	16,000	.00082	.00004	....	....	
17,000	17,000	.00090	.00008	....	....	
18,000	18,000	.00096	.00006	....	....	
19,000	19,000	.00104	.00008	....	....	
20,000	20,000	.00110	.00006	.00014	.00010	
21,000	21,000	.00116	.00006	....	....	
22,000	22,000	.00124	.00008	....	....	
23,000	23,000	.00132	.00008	....	....	
24,000	24,000	.00140	.00008	....	....	
25,000	25,000	.00150	.00010	.00030	.00016	
26,000	26,000	.00162	.00012	....	....	
27,000	27,000	.00172	.00010	....	....	
28,000	28,000	.00190	.00018	....	....	
29,000	29,000	.00202	.00012	....	....	
30,000	30,000	.00224	.00022	.00070	.00046	
31,000	31,000	.00246	.00022	....	....	
32,000	32,000	.00268	.00022	....	....	
33,000	33,000	.00296	.00028	....	....	
34,000	34,000	.00330	.00034	....	....	
35,000	35,000	.00368	.00038	.00196	.00120	
36,000	36,000	.00420	.00052	....	....	
37,000	37,000	.00456	.00036	....	....	
38,000	38,000	.00500	.00044	....	....	
39,000	39,000	.00550	.00050	....	....	
40,000	40,000	.00608	.00058	.00414	.00218	
41,000	41,000	.00680	.00072	....	....	
42,000	42,000	.00726	.00046	....	....	
43,000	43,000	.00790	.00064	....	....	
44,000	44,000	.00860	.00070	....	....	
45,000	45,000	.00918	.00058	.00684	.00270	
46,000	46,000	.01018	.00100	....	....	
47,000	47,000	.01096	.00078	....	....	
48,000	48,000	.01196	.00100	....	....	
49,000	49,000	.01320	.00124	....	....	
50,000	50,000	.01420	.00100	.01138	.00454	
55,910	55,910	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 8.

No. 4578.

Marks, $^{12\,M\,R_4\,T\,R_2}_{\quad B\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied load.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000205	.000055	0.	....	
6,000	6,000	.000260	.000055	....	....	
7,000	7,000	.000315	.000055	....	....	
8,000	8,000	.000380	.000065	....	....	
9,000	9,000	.000440	.000060	....	....	
10,000	10,000	.000500	.000060	.000030	.000030	
11,000	11,000	.000570	.000070	....	....	
12,000	12,000	.000645	.000075	.000045	.000015	
13,000	13,000	.000710	.000065	....	....	
14,000	14,000	.000795	.000085	.000080	.000035	
15,000	15,000	.000885	.000090	....	....	
16,000	16,000	.000960	.000075	.000115	.000035	
17,000	17,000	.001070	.000110	....	....	
18,000	18,000	.001170	.000100	.000190	.000075	
19,000	19,000	.001300	.000130	....	....	
20,000	20,000	.001440	.000140	.000310	.000120	
21,000	21,000	.001590	.000150	....	....	
22,000	22,000	.001775	.000185	.000510	.000200	
23,000	23,000	.001975	.000200	....	....	
24,000	24,000	.002290	.000315	.000850	.000340	
28,040	28,040	....	....	....	....	Tensile strength.

Fractured 5″ from neck. Appearance, uniform, granular.

No. 4579.

Marks, $^{12\,M\,R_2\,T\,R_1}_{\quad\; M\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000255	.000055	....	....	
7,000	7,000	.000305	.000050	....	....	
8,000	8,000	.000355	.000050	....	....	
9,000	9,000	.000410	.000055	....	....	
10,000	10,000	.000470	.000060	.000020	.000020	
11,000	11,000	.000540	.000070	....	....	
12,000	12,000	.000605	.000065	.000040	.000040	
13,000	13,000	.000685	.000080	....	....	
14,000	14,000	.000750	.000065	.000060	.000020	
15,000	15,000	.000825	.000075	....	....	
16,000	16,000	.000905	.000080	.000105	.000045	
17,000	17,000	.001005	.000100	....	....	
18,000	18,000	.001100	.000095	.000185	.000080	
19,000	19,000	.001215	.000115	....	....	
20,000	20,000	.001345	.000130	.000285	.000100	
21,000	21,000	.001510	.000165	....	....	
22,000	22,000	.001700	.000190	.000495	.000210	
23,000	23,000	.001960	.000260	....	....	
24,000	24,000	.002210	.000250	.000855	.000360	
25,000	25,000	.002565	.000355	.001130	.000275	
25,690	25,690	....	....	....	....	Tensile strength.

Fractured ½″ from middle. Appearance, uniform, granular.

No. 983.

Marks, 12 M R_1 T R_2 B T_3
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00016	.00010	....	....	
4,000	4,000	.00020	.00004	....	....	
5,000	5,000	.00026	.00006	.00006	.00006	
6,000	6,000	.00030	.00004	....	....	
7,000	7,000	.00038	.00008	....	....	
8,000	8,000	.00042	.00004	....	....	
9,000	9,000	.00048	.00006	....	....	
10,000	10,000	.00052	.00004	.00008	.00002	
11,000	11,000	.00056	.00004	....	....	
12,000	12,000	.00062	.00006	....	....	
13,000	13,000	.00068	.00006	....	....	
14,000	14,000	.00076	.00008	....	....	
15,000	15,000	.00082	.00006	.00010	.00002	
16,000	16,000	.00086	.00004	....	....	
17,000	17,000	.00094	.00008	....	....	
18,000	18,000	.00100	.00006	....	....	
19,000	19,000	.00106	.00006	....	....	
20,000	20,000	.00114	.00008	.00018	.00008	
21,000	21,000	.00120	.00006	....	....	
22,000	22,000	.00126	.00006	....	....	
23,000	23,000	.00134	.00008	....	....	
24,000	24,000	.00142	.00008	....	....	
25,000	25,000	.00154	.00012	.00030	.00012	
26,000	26,000	.00164	.00010	....	....	
27,000	27,000	.00170	.00006	....	....	
28,000	28,000	.00182	.00012	....	....	
29,000	29,000	.00196	.00014	....	....	
30,000	30,000	.00212	.00016	.00070	.00040	
31,000	31,000	.00230	.00018	....	....	
32,000	32,000	.00250	.00020	....	....	
33,000	33,000	.00270	.00020	....	....	
34,000	34,000	.00300	.00030	....	....	
35,000	35,000	.00336	.00036	.00158	.00088	
36,000	36,000	.00374	.00038	....	....	
37,000	37,000	.00398	.00024	....	....	
38,000	38,000	.00444	.00046	....	....	
39,000	39,000	.00480	.00036	....	....	
40,000	40,000	.00506	.00026	.00320	.00162	
41,000	41,000	.00544	.00038	....	....	
42,000	42,000	.00574	.00030	....	....	
43,000	43,000	.00640	.00066	....	....	
44,000	44,000	.00684	.00044	....	....	
45,000	45,000	.00728	.00044	.00514	.00194	
46,000	46,000	.00786	.00058	....	....	
47,000	47,000	.00816	.00030	....	....	
48,000	48,000	.00840	.00024	....	....	
49,000	49,000	.00854	.00014	....	....	
50,000	50,000	.00858	.00004	.00622	.00108	
58,680	58,680	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 984.

Marks, $\frac{12\ M\ R_8\ T\ R_8}{B\ R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00018	.00006	....	....	
5,000	5,000	.00022	.00004	0.	....	
6,000	6,000	.00026	.00004	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00046	.00004	0.	....	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00060	.00008	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00070	.00004	....	....	
15,000	15,000	.00076	.00006	.00006	.00006	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00092	.00006	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00104	.00006	.00012	.00006	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00118	.00008	....	....	
23,000	23,000	.00126	.00008	....	....	
24,000	24,000	.00134	.00008	....	....	
25,000	25,000	.00140	.00006	.00024	.00012	
26,000	26,000	.00150	.00010	....	....	
27,000	27,000	.00158	.00008	....	....	
28,000	28,000	.00170	.00012	....	....	
29,000	29,000	.00186	.00016	....	....	
30,000	30,000	.00208	.00022	.00066	.00042	
31,000	31,000	.00232	.00024	....	....	
32,000	32,000	.00244	.00012	....	....	
33,000	33,000	.00266	.00022	....	....	
34,000	34,000	.00294	.00028	....	....	
35,000	35,000	.00340	.00046	.00176	.00110	
36,000	36,000	.00378	.00038	....	....	
37,000	37,000	.00412	.00034	....	....	
38,000	38,000	.00446	.00034	....	....	
39,000	39,000	.00476	.00030	....	....	
40,000	40,000	.00538	.00062	.00374	.00198	
41,000	41,000	.00598	.00060	....	....	
42,000	42,000	.00634	.00036	....	....	
43,000	43,000	.00710	.00076	....	....	
44,000	44,000	.00754	.00044	....	....	
45,000	45,000	.00810	.00056	.00612	.00236	
46,000	46,000	.00880	.00070	....	....	
47,000	47,000	.00958	.00078	....	....	
48,000	48,000	.00996	.00038	....	....	
49,000	49,000	.01084	.00088	....	....	
50,000	50,000	.01200	.00116	.00936	.00324	
58,750	58,750	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 985.

Marks, $^{12\,\mathrm{M\,R_1\,T\,B_1}}_{\mathrm{M\,T_2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	.0	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00040	.00004	....	....	
10,000	10,000	.00046	.00006	.00004	.00004	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00072	.00008	.00006	.00002	
16,000	16,000	.00076	.00004	....	....	
17,000	17,000	.00084	.00008	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00102	.00006	.00012	.00006	
21,000	21,000	.00106	.00004	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00136	.00008	.00022	.00010	
26,000	26,000	.00142	.00006	....	....	
27,000	27,000	.00150	.00008	....	....	
28,000	28,000	.00160	.00010	....	....	
29,000	29,000	.00172	.00012	....	....	
30,000	30,000	.00184	.00012	.00046	.00024	
31,000	31,000	.00204	.00020	....	....	
32,000	32,000	.00214	.00010	....	....	
33,000	33,000	.00230	.00016	....	....	
34,000	34,000	.00250	.00020	....	....	
35,000	35,000	.00280	.00030	.00114	.00068	
36,000	36,000	.00310	.00030	....	....	
37,000	37,000	.00344	.00034	....	....	
38,000	38,000	.00380	.00036	....	....	
39,000	39,000	.00436	.00056	....	....	
40,000	40,000	.00480	.00044	.00292	.00178	
41,000	41,000	.00520	.00040	....	....	
42,000	42,000	.00570	.00050	....	....	
43,000	43,000	.00598	.00028	....	....	
44,000	44.000	.00650	.00052	....	....	
45,000	45,000	.00696	.00046	.00486	.00194	
46,000	46,000	.00732	.00036	....	....	
47,000	47,000	.00770	.00038	....	....	
48,000	48,000	.00806	.00036	....	....	
49,000	49,000	.00848	.00042	....	....	
50,000	50,000	.00876	.00028	.00664	.00178	
58,020	58,020	....	....	....	....	Ultimate strength..

Failed by triple flexure.

BODY NO. 9.

No. 4580.

Marks, $\substack{12\ \mathrm{M\ R_9\ T\ R_3}\\ \mathrm{B\ T_1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000155	.000055	....	....	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000260	.000055	....	....	
7,000	7,000	.000320	.000060	....	....	
8,000	8,000	.000380	.000060	....	....	
9,000	9,000	.000445	.000065	....	....	
10,000	10,000	.000510	.000065	.000015	.000010	
11,000	11,000	.000570	.000060	....	....	
12,000	12,000	.000640	.000070	.000035	.000020	
13,000	13,000	.000710	.000070	....	....	
14,000	14,000	.000790	.000080	.000060	.000625	
15,000	15,000	.000880	.000090	....	....	
16,000	16,000	.000965	.000085	.000105	.000045	
17,000	17,000	.001065	.000100	....	....	
18,000	18,000	.001190	.000125	.000190	.000085	
19,000	19,000	.001310	.000120	....	....	
20,000	20,000	.001455	.000145	.000315	.000125	
21,000	21,000	.001645	.000190	....	....	
22,000	22,000	.001850	.000205	.000550	.000235	
23,000	23,000	002100	.000250	....	....	
24,000	24,000	.002375	.000275	.000920	.000370	
28,030	28,030	....	....	....	....	Tensile strength.

Fractured 9″ from neck. Appearance; uniform, granular.

No. 4581.

Marks, $12\,M\,\underset{M}{R_1}\,\underset{T_1}{T}\,R_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23¼″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000255	.000055	....	....	
7,000	7,000	.000305	.000050	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000415	.000055	....	....	
10,000	10,000	.000480	.000065	.000010	.000010	
11,000	11,000	.000540	.000060	....	....	
12,000	12,000	.000605	.000065	.000030	.000020	
13,000	13,000	.000670	.000065	....	....	
14,000	14,000	.000735	.000065	.000050	.000020	
15,000	15,000	.000810	.000075	....	....	
16,000	16,000	.000895	.000085	.000085	.000055	
17,000	17,000	.000985	.000090	....	....	
18,000	18,000	.001075	.000090	.000140	.000055	
19,000	19,000	.001180	.000105	....	....	
20,000	20,000	.001290	.000110	.000235	.000095	
21,000	21,000	.001435	.000145	....	....	
22,000	22,000	.001590	.000155	.000390	.000155	
23,000	23,000	.001775	.000185	....	....	
24,000	24,000	.001985	.000210	.000640	.000250	
25,000	25,000	.002275	.000290	.000845	.000205	
26,980	26,980	....	....	....	....	Tensile strength.

Fractured 11″ from neck. Appearance, uniform, granular.

No. 986.

Marks, $\substack{\text{12 M R, T R,}\\ \text{B T,}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006			
3,600	3,000	.00016	.00010			
4,000	4,000	.00022	.00006			
5,000	5,000	.00026	.00004	.00006	.00006	
6,000	6,000	.00032	.00006			
7,000	7,000	.00038	.00006			
8,000	8,000	.00044	.00006			
9,000	9,000	.00050	.00006			
10,000	10,000	.00056	.00006	.00010	.00004	
11,000	11,000	.00062	.00006			
12,000	12,000	.00066	.00004			
13,000	13,000	.00072	.00006			
14,000	14,000	.00080	.00008			
15,000	15,000	.00088	.00008	.00016	.00006	
16,000	16,000	.00094	.00006			
17,000	17,000	.00100	.00006			
18,000	18,000	.00106	.00006			
19,000	19,000	.00108	.00002			
20,000	20,000	.00120	.00012	.00022	.00006	
21,000	21,000	.00130	.00010			
22,000	22,000	.00138	.00008			
23,000	23,000	.00146	.00908			
24,000	24,000	.00154	.00008			
25,000	25,000	.00164	.00010	.00040	.00018	
26,000	26,000	.00174	.00010			
27,000	27,000	.00186	.00012			
28,000	28,000	.00198	.00012			
29,000	29,000	.00212	.00014			
30,000	30,000	.00228	.00016	.00074	.00034	
31,000	31,000	.00250	.00022			
32,000	32,000	.00266	.00016			
33,000	33,000	.00288	.00022			
34,000	34,000	.00320	.00032			
35,000	35,000	.00352	.00032	.00170	.00096	
36,000	36,000	.00390	.00038			
37,000	37,000	.00418	.00028			
38,000	38,000	.00456	.00038			
39,000	39,000	.00502	.00046			
40,000	40,000	.00538	.00036	.00346	.00176	
41,000	41,000	.00600	.00062			
42,000	42,000	.00650	.00050			
43,000	43,000	.00700	.00050			
44,000	44,000	.00756	.00056			
45,000	45,000	.00796	.00040	.00562	.00216	
46,000	46,000	.00858	.00062			
47,000	47,000	.00918	.00060			
48,000	48,000	.00972	.00054			
49,000	49,000	.01022	.00050			
50,000	50,000	.01088	.00066	.00816	.00254	
59,500	59,500					Ultimate strength.

Failed by triple flexure.

No. 987.

Marks, $\overset{12\,M\,R_3\,T\,R_3}{B\,R_{10}}$
Length, 10″.5
Diameter, 1″.129
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00044	.00004	0.	....	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00004	.00004	
16,000	16,000	.00078	.00006	....	....	
17,000	17,000	.00084	.00006	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00104	.00008	.00010	.00006	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00116	.00006	....	....	
23,000	23,000	.00124	.00008	....	....	
24,000	24,000	.00134	.00010	....	....	
25,000	25,000	.00142	.00008	.00022	.00012	
26,000	26,000	.00150	.00008	....	....	
27,000	27,000	.00160	.00010	....	....	
28,000	28,000	.00172	.00012	....	....	
29,000	29,000	.00186	.00014	....	....	
30,000	30,000	.00200	.00014	.00056	.00034	
31,000	31,000	.00220	.00020	....	....	
32,000	32,000	.00238	.00018	....	....	
33,000	33,000	.00254	.00016	....	....	
34,000	34,000	.00284	.00030	....	....	
35,000	35,000	.00320	.00036	.00148	.00092	
36,000	36,000	.00350	.00030	....	....	
37,000	37,000	.00378	.00028	....	....	
38,000	38,000	.00426	.00048	....	....	
39,000	39,000	.00482	.00056	....	....	
40,000	40,000	.00520	.00038	.00320	.00172	
41,000	41,000	.00576	.00056	....	....	
42,000	42,000	.00618	.00042	....	....	
43,000	43,000	.00660	.00042	....	....	
44,000	44,000	.00718	.00058	....	....	
45,000	45,000	.00768	.00050	.00542	.00222	
46,000	46,000	.00816	.00048	....	....	
47,000	47,000	.00864	.00048	....	....	
48,000	48,000	.00914	.00050	....	....	
49,000	49,000	.00950	.00036	....	....	
50,000	50,000	.00976	.00026	.00720	.00178	
59,650	59,650	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 988.

Marks, $\substack{\text{12 M R, T R,}\\ \text{M T}_3}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00016	.00006			
5,000	5,000	.00022	.00006	0.		
6,000	6,000	.00028	.00006			
7,000	7,000	.00032	.00004			
8,000	8,000	.00038	.00006			
9,000	9,000	.00044	.00006			
10,000	10,000	.00048	.00004	0.		
11,000	11,000	.00054	.00006			
12,000	12,000	.00058	.00004			
13,000	13,000	.00064	.00006			
14,000	14,000	.00070	.00006			
15,000	15,000	.00076	.00006	.00002	.00002	
16,000	16,000	.00082	.00006			
17,000	17,000	.00088	.00006			
18,000	18,000	.00094	.00006			
19,000	19,000	.00100	.00006			
20,000	20,000	.00106	.00006	.00012	.00010	
21,000	21,000	.00114	.00008			
22,000	22,000	.00122	.00008			
23,000	23,000	.00128	.00006			
24,000	24,000	.00136	.00008			
25,000	25,000	.00144	.00008	.00024	.00012	
26,000	26,000	.00152	.00008			
27,000	27,000	.00158	.00006			
28,000	28,000	.00166	.00008			
29,000	29,000	.00180	.00014			
30,000	30,000	.00198	.00018	.00046	.00022	
31,000	31,000	.00206	.00008			
32,000	32,000	.00222	.00016			
33,000	33,000	.00244	.00022			
34,000	34,000	.00264	.00020			
35,000	35,000	.00294	.00030	.00118	.00072	
36,000	36,000	.00324	.00030			
37,000	37,000	.00354	.00030			
38,000	38,000	.00398	.00044			
39,000	39,000	.00450	.00052			
40,000	40,000	.00504	.00054	.00304	.00186	
41,000	41,000	.00580	.00076			
42,000	42,000	.00650	.00070			
43,000	43,000	.00734	.00084			
44,000	44,000	.00814	.00080			
45,000	45,000	.00904	.00090	.00660	.00356	
46,000	46,000	.00980	.00076			
47,000	47,000	.01110	.00130			
48,000	48,000	.01234	.00124			
49,000	49,000	.01390	.00156			
50,000	50,000	.01576	.00186	.01200	.00600	
57,200	57,200					Ultimate strength.

Failed by triple flexure.

BODY No. 10.

No. 4584.

Marks, $^{12}\underset{\text{B T}_1}{\text{M R}_{10}}\,\text{T R}_2$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000110	.000055	....	....	
4,000	4,000	.000165	.000055	....	....	
5,000	5,000	.000225	.000060	0.	....	
6,000	6,000	.000285	.000060	....	....	
7,000	7,000	.000345	.000060	....	....	
8,000	8,000	.000405	.000060	....	....	
9,000	9,000	.000465	.000060	....	....	
10,000	10,000	.000535	.000070	.000030	.000030	
11,000	11,000	.000605	.000070	....	....	
12,000	12,000	.000690	.000085	.000055	.000025	
13,000	13,000	.000770	.000080	....	....	
14,000	14,000	.000855	.000085	.000095	.000040	
15,000	15,000	.000945	.000090	....	....	
16,000	16,000	.001050	.000105	.000155	.000060	
17,000	17,000	.001160	.000110	....	....	
18,000	18,000	.001280	.000120	.000245	.000090	
19,000	19,000	.001430	.000150	....	....	
20,000	20,000	.001600	.000170	.000410	.000165	
21,000	21,000	.001815	.000215	....	....	
22,000	22,000	.002050	.000235	.000695	.000285	
23,000	23,000	.002350	.000300	....	....	
24,000	24,000	.002700	.000350	.001195	.000500	
24,980	24,980	....	....	....	....	Tensile strength.

Fractured 4″.5 from neck. Appearance, uniform, granular.

No. 4585.

Marks, $\genfrac{}{}{0pt}{}{12\,\mathrm{M\,R_{10}\,T\,R_1}}{\mathrm{M\,T_1}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000090	.000045	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000250	.000060	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000410	.000060	....	....	
10,000	10,000	.000465	.000055	.000010	.000010	
11,000	11,000	.000525	.000060	....	....	
12,000	12,000	.000585	.000060	.000035	.000025	
13,000	13,000	.000655	.000070	....	....	
14,000	14,000	.000725	.000070	.000055	.000020	
15,000	15.000	.000795	.000070	....	....	
16,000	16.000	.000875	.000080	.000090	.000035	
17,000	17,000	.000960	.000085	....	....	
18,000	18,000	.001040	.000080	.000140	.000050	
19,000	19,000	.001150	.000110	....	....	
20,000	20,000	.001255	.000105	.000225	.000085	
21,000	21,000	.001400	.000145	....	....	
22,000	22,000	.001530	.000130	.000370	.000145	
23,000	23,000	.001730	.000200	....	....	
24,000	24,000	.001915	.000215	.000625	.000255	
25,000	25,000	.002230	.000285	.000840	.000215	
27,320	27,320	....	....	....	....	Tensile strength.

Fractured 10'' from neck. Appearance, uniform, granular.

No. 992.

Marks, $^{12\ \mathrm{M\ R_{10}\ T\ R_2}}_{\mathrm{B\ T_3}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00022	.00036	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00044	.00006	0.	....	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00064	.00010	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00004	.00004	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00088	.00008	....	....	
18,000	18,000	.00094	.00006	....	....	
19,000	19,000	.00100	.00006	....	....	
20,000	20,000	.00106	.00006	.00014	.00010	
21,000	21,000	.00114	.00008	....	....	
22,000	22,000	.00122	.00008	....	....	
23,000	23,000	.00132	.00010	....	....	
24,000	24,000	.00140	.00008	....	....	
25,000	25,000	.00150	.00010	.00028	.00014	
26,000	26,000	.00162	.00012	....	....	
27,000	27,000	.00172	.00010	....	....	
28,000	28,000	.00184	.00012	....	....	
29,000	29,000	.00198	.00014	....	....	
30,000	30,000	.00210	.00012	.00064	.00036	
31,000	31,000	.00240	.00030	....	....	
32,000	32,000	.00256	.00016	....	....	
33,000	33,000	.00282	.00026	....	....	
34,000	34,000	.00316	.00034	....	....	
35,000	35,000	.00354	.00038	.00176	.00112	
36,000	36,000	.00396	.00042	....	....	
37,000	37,000	.00422	.00026	....	....	
38,000	38,000	.00464	.00042	....	....	
39,000	39,000	.00514	.00050	....	....	
40,000	40,000	.00576	.00062	.00376	.00200	
41,000	41,000	.00640	.00064	....	....	
42,000	42,000	.00676	.00036	....	....	
43,000	43,000	.00722	.00046	....	....	
44,000	44,000	.00810	.00088	....	....	
45,000	45,000	.00890	.00080	.00646	.00270	
46,000	46,000	.00936	.00046	....	....	
47,000	47,000	.00974	.00038	....	....	
48,000	48,000	.01050	.00076	....	....	
49,000	49,000	.01138	.00088	....	....	
50,000	50,000	.01200	.00062	.00926	.00280	
57,200	57,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 993.

Marks, $\genfrac{}{}{0pt}{}{12\ M\ R_{10}\ T\ R_2}{B\ R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,090	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00036	.00004	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00052	.00004	....	....	
12,000	12,000	.00060	.00008	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00072	.00006	....	....	
15,000	15,000	.00078	.00006	.00006	.00004	
16,000	16,000	.00080	.00002	....	....	
17,000	17,000	.00088	.00008	....	....	
18,000	18,000	.00094	.00006	....	....	
19,000	19,000	.00102	.00008	....	....	
20,000	20,000	.00110	.00008	.00014	.00008	
21,000	21,000	.00118	.00008	....	....	
22,000	22,000	.00124	.00006	....	....	
23,000	23,000	.00130	.00006	....	....	
24,000	24,000	.00138	.00008	....	....	
25,000	25,000	.00148	.00010	.00026	.00012	
26,000	26,000	.00160	.00012	....	....	
27,000	27,000	.00172	.00012	....	....	
28,000	28,000	.00184	.00012	....	....	
29,000	29,000	.00198	.00014	....	....	
30,000	30,000	.00216	.00018	.00066	.00040	
31,000	31,000	.00236	.00020	....	....	
32,000	32,000	.00254	.00018	....	....	
33,000	33,000	.00276	.00022	....	....	
34,000	34,000	.00316	.00040	....	....	
35,000	35,000	.00354	.00038	.00174	.00108	
36,000	36,000	.00388	.00034	....	....	
37,000	37,000	.00426	.00038	....	....	
38,000	38,000	.00468	.00042	....	....	
39,000	39,000	.00508	.00040	....	....	
40,000	40,000	.00562	.00054	.00360	.00186	
41,000	41,000	.00624	.00062	....	....	
42,000	42,000	.00654	.00030	....	....	
43,000	43,000	.00714	.00060	....	....	
44,000	44,000	.00774	.00060	....	....	
45,000	45,000	.00858	.00084	.00636	.00276	
46,000	46,000	.00920	.00062	....	....	
47,000	47,000	.00958	.00038	....	....	
48,000	48,000	.01010	.00052	....	....	
49,000	49,000	.01090	.00080	....	....	
50,100	50,000	.01160	.00070	.00884	.00248	
58,980	58,980	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 994.

Marks, $\overset{12\,M\,R_{18}\,T\,R_1}{M\,T}$,
Length, 10″. 5.
Diameter, 1″. 129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00018	.00006	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00030	.00006			
8,000	8,000	.00034	.00004			
9,000	9,000	.00040	.00006			
10,000	10,000	.00044	.00004	.00004	.00004	
11,000	11,000	.00048	.00004			
12,000	12,000	.00060	.00012			
13,000	13,000	.00066	.00006			
14,000	14,000	.00074	.00008			
15,000	15,000	.00078	.00004	.00008	.00004	
16,000	16,000	.00082	.00004			
17,000	17,000	.00090	.00008			
18,000	18,000	.00100	.00010			
19,000	19,000	.00106	.00006			
20,000	20,000	.00112	.00006	.00012	.00004	
21,000	21,000	.00120	.00008			
22,000	22,000	.00128	.00008			
23,000	23,000	.00134	.00006			
24,000	24,000	.00144	.00010			
25,000	25,000	.00154	.00010	.00030	.00018	
26,000	26,000	.00166	.00012			
27,000	27,000	.00180	.00014			
28,000	28,000	.00194	.00014			
29,000	29,000	.00210	.00016			
30,000	30,000	.00230	.00020	.00076	.00046	
31,000	31,000	.00260	.00030			
32,000	32,000	.00276	.00016			
33,000	33,000	.00296	.00020			
34,000	34,000	.00326	.00030			
35,000	35,000	.00366	.00040	.00188	.00112	
36,000	36,000	.00410	.00044			
37,000	37,000	.00446	.00036			
38,000	38,000	.00500	.00054			
39,000	39,000	.00546	.00046			
40,000	40,000	.00590	.00044	.00380	.00192	
41,000	41,000	.00662	.00072			
42,000	42,000	.00698	.00036			
43,000	43,000	.00750	.00052			
44,000	44,000	.00804	.00054			
45,000	45,000	.00880	.00076	.00636	.00256	
46,000	46,000	.00940	.00060			
47,000	47,000	.00966	.00026			
48,000	48,000	.01010	.00044			
49,000	49,000	.01056	.00046			
50,000	50,000	.01110	.00054	.00852	.00216	
56,380	56,380					Ultimate strength.

Failed by triple flexure.

BODY No. 10 (second casting).

No. 4594.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{11},\,\mathrm{T}\,\mathrm{R}_{2}}_{\mathrm{B}\,\mathrm{T}_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000090	.000040	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000240	.000050	....	....	
7,000	7,000	.000290	.000050	....	....	
8,000	8,000	.000345	.000055	....	....	
9,000	9,000	.000400	.000055	....	....	
10,000	10,000	.000455	.000055	.000010	.000010	
11,000	11,000	.000510	.000055	....	....	
12,000	12,000	.000570	.000060	.000030	.000020	
13,000	13,000	.000650	.000080	....	....	
14,000	14,000	.000710	.000060	.000040	.000010	
15,000	15,000	.000780	.000070	....	....	
16,000	16,000	.000850	.000070	.000080	.000040	
17,000	17,000	.000940	.000090	....	....	
18,000	18,000	.001010	.000070	.000110	.000030	
19,000	19,000	.001120	.000110	....	....	
20,000	20,000	.001210	.000090	.000200	.000090	
21.000	21,000	.001350	.000140	....	....	
22,000	22,000	.001465	.000115	.000310	.000110	
23,000	23,000	.001645	.000180	....	....	
24,000	24,000	.001800	.000155	.000520	.000210	
25,000	25,000	....	....	....	....	Tensile strength.

Fractured 10″ from neck. Appearance, 40 per cent uniform, granular, 60 per cent coarse granular with dark colored spangles. A well-defined line of demarcation between the two kinds of surface.

No. 4595.

Marks, $\genfrac{}{}{0pt}{}{12\,M\,R_{10}\,T\,R_{1}}{M\,T_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000195	.000045	.000005	.000005	
6,000	6,000	.000240	.000045	....	....	
7,000	7,000	.000295	.000055	....	....	
8,000	8,000	.000345	.000050	....	....	
9,000	9,000	.000400	.000055	....	....	
10,000	10,000	.000450	.000050	.000020	.000015	
11,000	11,000	.000505	.000055	....	....	
12,000	12,000	.000560	.000055	.000035	.000015	
13,000	13,000	.000625	.000065	....	....	
14,000	14,000	.000685	.000060	.000055	.000020	
15,000	15,000	.000750	.000065	....	....	
16,000	16,000	.000815	.000065	.000085	.000030	
17,000	17,000	.000900	.000085	....	....	
18,000	18,000	.000985	.000085	.000135	.000050	
19,000	19,000	.001060	.000075	....	....	
20,000	20,000	.001155	.000095	.000200	.000065	
21,000	21,000	.001300	.000145	....	....	
22,000	22,000	.001400	.000100	.000310	.000110	
23,000	23,000	.001555	.000155	....	....	
24,000	24,000	.001735	.000180	.000500	.000190	
25,000	25,000	.001960	.000225	.000660	.000160	
26,940	26,940	....	....	....	....	Tensile strength.

Fractured 2¼″ from neck. Appearance, granular, mottled.

No. 1001.

Marks, $^{12\,M\,R_1,\,T\,R_3}_{B\,T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00016	.00006			
5,000	5,000	.00020	.00004	0.		
6,000	6,000	.00026	.00006			
7,000	7,000	.00030	.00004			
8,000	8,000	.00036	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00048	.00008	.00004	.00004	
11,000	11.000	.00054	.00006			
12,000	12,600	.00060	.00006			
13,000	13,000	.00064	.00004			
14,000	14,000	.00070	.00006			
15,000	15,000	.00076	.00006	.00010	.00006	
16,000	16,000	.00080	.00004			
17,000	17,000	.00086	.00006			
18,000	18,000	.00094	.00008			
19,000	19,000	.00100	.00006			
20,000	20,000	.00106	.00006	.00016	.00006	
21,000	21,000	.00114	.00008			
22,000	22,000	.00120	.00006			
23,000	23,000	.00126	.00006			
24,000	24,000	.00134	.00008			
25,000	25,000	.00142	.00008	.00028	.00012	
26,000	26,000	.00154	.00012			
27,000	27,000	.00160	.00006			
28,000	28,000	.00174	.00014			
29,000	29.000	.00182	.00008			
30,000	30,000	.00194	.00012	.00054	.00026	
31,000	31,000	.00208	.00014			
32,000	32,000	.00228	.00020			
33,000	33,000	.00248	.00020			
34,000	34,000	.00268	.00020			
35,000	35,000	.00294	.00026	.00126	.00072	
36,000	36,000	.00326	.00032			
37,000	37,000	.00356	.00030			
38,000	38,000	.00400	.00044			
39,000	39,000	.00446	.00046			
40,000	40,000	.00486	.00040	.00294	.00168	
41,000	41,000	.00540	.00054			
42,000	42,000	.00590	.00050			
43,000	43,000	.00646	.00056			
44,000	44,000	.00700	.00054			
45,000	45,000	.00786	.00086	.00560	.00266	
46,000	46,000	.00856	.00070			
47,000	47,000	.00928	.00072			
48,000	48,000	.00992	.00064			
49,000	49,000	.01074	.00082			
50,000	50,000	.01204	.00130	.00932	.00372	
59,200	59,200					Ultimate strength.

Failed by triple flexure.

No. 1002.

Marks, $\text{12 M R}_{10}\text{ T R}_{2}\ \text{B R}_{28}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006			
3,000	3,000	.00010	.00004			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00022	.00004			
7,000	7,000	.00028	.00006			
8,000	8,000	.00034	.00006			
9,000	9,000	.00038	.00004			
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006			
12,000	12,000	.00054	.00004			
13,000	13,000	.00060	.00006			
14,000	14,000	.00064	.00004			
15,000	15,000	.00070	.00006	.00002	0.	
16,000	16,000	.00072	.00002			
17,000	17,000	.00076	.00004			
18,000	18,000	.00084	.00008			
19,000	19,000	.00090	.00006			
20,000	20,000	.00096	.00006	.00008	.00006	
21,000	21,000	.00102	.00006			
22,000	22,000	.00110	.00008			
23,000	23,000	.00116	.00006			
24,000	24,000	.00122	.00006			
25,000	25,000	.00130	.00008	.00012	.00004	
26,000	26,000	.00140	.00010			
27,000	27,000	.00148	.00008			
28,000	28,000	.00158	.00010			
29,000	29,000	.00166	.00008			
30,000	30,000	.00180	.00014	.00024	.00012	
31,000	31,000	.00198	.00018			
32,000	32,000	.00216	.00018			
33,000	33,000	.00234	.00018			
34,000	34,000	.00256	.00022			
35,000	35,000	.00294	.00038	.00130	.00106	
36,000	36,000	.00322	.00028			
37,000	37,000	.00354	.00032			
38,000	38,000	.00400	.00046			
39,000	39,000	.00448	.00048			
40,000	40,000	.00484	.00036	.00296	.00166	
41,000	41,000	.00532	.00048			
42,000	42,000	.00570	.00038			
43,000	43,000	.00630	.00060			
44,000	44,000	.00684	.00054			
45,000	45,000	.00740	.00056	.00518	.00222	
46,000	46,000	.00786	.00046			
47,000	47,000	.00834	.00048			
48,000	48,000	.00886	.00052			
49,000	49,000	.00924	.00038			
50,000	50,000	.00970	.00046	.00726	.00208	
58,980	58,980					Ultimate strength.

Failed by triple flexure.

No. 1003.

Marks, $\genfrac{}{}{0pt}{}{12\,\mathrm{M\,R_{12}\,T\,R_{1}}}{\mathrm{M\,T_{12}}}$
Length, 10''.5.
Diameter 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00018	.00006	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00028	.00004			
8,000	8,000	.00032	.00004			
9,000	9,000	.00038	.00006			
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00048	.00006			
12,000	12,000	.00054	.00006			
13,000	13,000	.00060	.00006			
14,000	14,000	.00064	.00004			
15,000	15,000	.00070	.00006	.00004	.00002	
16,000	16,000	.00076	.00006			
17,000	17,000	.00080	.00004			
18,000	18,000	.00086	.00006			
19,000	19,000	.00093	.00006			
20,000	20,000	.00098	.00006	.00014	.00010	
21,000	21,000	.00104	.00006			
22,000	22,000	.00110	.00006			
23,000	23,000	.00118	.00008			
24,000	24,000	.00124	.00006			
25,000	25,000	.00132	.00008	.00020	.00006	
26,000	26,000	.00138	.00006			
27,000	27,000	.00146	.00008			
28,000	28,000	.00156	.00010			
29,000	29,000	.00170	.00014			
30,000	30,000	.00180	.00010	.00044	.00024	
31,000	31,000	.00196	.00016			
32,000	32,000	.00214	.00018			
33,000	33,000	.00234	.00020			
34,000	34,000	.00264	.00030			
35,000	35,000	.00290	.00026	.00130	.00086	
36,000	36,000	.00330	.00040			
37,000	37,000	.00360	.00030			
38,000	38,000	.00394	.00034			
39,000	39,000	.00440	.00046			
40,000	40,000	.00496	.00056	.00306	.00176	
41,000	41,000	.00546	.00050			
42,000	42,000	.00586	.00040			
43,000	43,000	.00640	.00054			
44,000	44,000	.00690	.00050			
45,000	45,000	.00740	.00050	.00524	.00218	
46,000	46,000	.00788	.00048			
47,000	47,000	.00822	.00034			
48,000	48,000	.00854	.00032			
49,000	49,000	.00880	.00026			
50,000	50,000	.00898	.00018	.00674	.00150	
57,970	57,970					Ultimate strength.

Failed by triple flexure.

BODY No. 10 (fourth casting).

No. 4618.

Marks, $\substack{^{12}\mathrm{M\,R_{10},\,T\,R_{2}} \\ \mathrm{B\,T_{21}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000305	.000055	....	....	
8,000	8,000	.000355	.000050	....	....	
9,000	9,000	.000410	.000055	....	....	
10,000	10,000	.000470	.000060	.000015	.000015	
11,000	11,000	.000535	.000065	....	....	
12,000	12,000	.000595	.000060	.000020	.000005	
13,000	13,000	.000660	.000065	....	....	
14,000	14,000	.000735	.000075	.000055	.000035	
15,000	15,000	.000805	.000070	....	....	
16,000	16,000	.000880	.000075	.000090	.000035	
17,000	17,000	.000970	.000090	....	....	
18,000	18,000	.001060	.000090	.000145	.000055	
19,000	19,000	.001150	.000090	....	....	
20,000	20,000	.001260	.000110	.000225	.000080	
21,000	21,000	.001390	.000130	....	....	
22,000	22,000	.001530	.000140	.000360	.000185	
23,000	23,000	.001700	.000170	....	....	
24,000	24,000	.001900	.000200	.000575	.000215	
25,000	25,000	.002150	.000250	.000755	.000180	
29,910	29,910	....	....	....	....	Tensile strength.

Fractured 8″.5 from neck. Appearance, granular.

No. 4619.

Marks, $^{12\,\mathrm{M\,R}_{16}\,\mathrm{T\,R}_{2}}_{\mathrm{M\,T}_{31}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000145	.000045	....	....	
5,000	5,000	.000195	.000050	0.	....	
6,000	6,000	.000240	.000045	....	....	
7,000	7,000	.000290	.000050	....	....	
8,000	8,000	.000335	.000045	....	....	
9,000	9,000	.000385	.000050	....	....	
10,000	10,000	.000435	.000050	.000010	.000010	
11,000	11,000	.000490	.000055	....	....	
12,000	12,000	.000540	.000050	.000025	.000015	
13,000	13,000	.000595	.000055	....	....	
14,000	14,000	.000650	.000055	.000035	.000010	
15,000	15,000	.000715	.000065	....	....	
16,000	16,000	.000775	.000060	.000060	.000025	
17,000	17,000	.000840	.000065	....	....	
18,000	18,000	.000910	.000070	.000090	.000030	
19,000	19,000	.000990	.000080	....	....	
20,000	20,000	.001070	.000080	.000130	.000040	
21,000	21,000	.001145	.000075	....	....	
22,000	22,000	.001225	.000080	.000190	.000060	
23,000	23,000	.001325	.000100	....	....	
24,000	24,000	.001425	.000100	.000280	.000090	
25,000	25,000	.001600	.000175	.000380	.000100	
28,140	28,140	....	....	....	....	Tensile strength.

Fractured at neck. Appearance, granular.

No. 1025.

Marks, $\begin{smallmatrix}12\,M\,R_{10}\,T\,R_2\\ B\,T_{22}\end{smallmatrix}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00016	.00004	0.		
6,000	6,000	.00020	.00004			
7,000	7,000	.00024	.00004			
8,000	8,000	.00028	.00004			
9,000	9,000	.00032	.00004			
10,000	10,000	.00038	.00006	0.		
11,000	11,000	.00044	.00006			
12,000	12,000	.00052	.00008			
13,000	13,000	.00056	.00004			
14,000	14,000	.00060	.00004			
15,000	15,000	.00064	.00004	.00008	.00008	
16,000	16,000	.00070	.00006			
17,000	17,000	.00074	.00004			
18,000	18,000	.00080	.00006			
19,000	19,000	.00084	.00004			
20,000	20,000	.00090	.00006	.00012	.00004	
21,000	21,000	.00100	.00010			
22,000	22,000	.00110	.00010			
23,000	23,000	.00120	.00010			
24,000	24,000	.00128	.00008			
25,000	25,000	.00136	.00008	.00022	.00010	
26,000	26,000	.00144	.00008			
27,000	27,000	.00152	.00008			
28,000	28,000	.00160	.00008			
29,000	29,000	.00170	.00010			
30,000	30,000	.00180	.00010	.00040	.00018	
31,000	31,000	.00192	.00012			
32,000	32,000	.00210	.00018			
33,000	33,000	.00226	.00016			
34,000	34,000	.00246	.00020			
35,000	35,000	.00278	.00032	.00110	.00070	
36,000	36,000	.00310	.00032			
37,000	37,000	.00344	.00034			
38,000	38,000	.00380	.00036			
39,000	39,000	.00410	.00030			
40,000	40,000	.00466	.00056	.00270	.00160	
41,000	41,000	.00520	.00054			
42,000	42,000	.00560	.00040			
43,000	43,000	.00608	.00048			
44,000	44,000	.00672	.00064			
45,000	45,000	.00736	.00064	.00500	.00230	
46,000	46,000	.00790	.00054			
47,000	47,000	.00848	.00058			
48,000	48,000	.00906	.00058			
49,000	49,000	.00970	.00064			
50,000	50,000	.01060	.00090	.00792	.00292	
60,380	60,380					Ultimate strength.

Failed by triple flexure.

No. 1026.

Marks, $^{12}\text{M}\ \text{R}_{10}\ \text{T}\ \text{R}_{4}$ $\text{B}\ \text{R}_{40}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00014	.00004			
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00026	.00006			
7,000	7,000	.00030	.00004			
8,000	8,000	.00036	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00046	.00006	.00004	.00002	
11,000	11,000	.00052	.00006			
12,000	12,000	.00058	.00006			
13,000	13,000	.00064	.00006			
14,000	14,000	.00068	.00004			
15,000	15,000	.00072	.00004	.00006	.00002	
16,000	16,000	.00078	.00006			
17,000	17,000	.00084	.00006			
18,000	18,000	.00088	.00004			
19,000	19,000	.00094	.00006			
20,000	20,000	.00100	.00006	.00010	.00004	
21,000	21,000	.00108	.00008			
22,000	22,000	.00116	.00008			
23,000	23,000	.00122	.00006			
24,000	24,000	.00128	.00006			
25,000	25,000	.00134	.00006	.00018	.00008	
26,000	26,000	.00142	.00008			
27,000	27,000	.00152	.00010			
28,000	28,000	.00160	.00008			
29,000	29,000	.00170	.00010			
30,000	30,000	.00182	.00012	.00042	.00024	
31,000	31,000	.00198	.00016			
32,000	32,000	.00214	.00016			
33,000	33,000	.00230	.00016			
34,000	34,000	.00254	.00024			
35,000	35,000	.00280	.00026	.00118	.00076	
36,000	36,000	.00312	.00032			
37,000	37,000	.00348	.00036			
38,000	38,000	.00392	.00044			
39,000	39,000	.00442	.00050			
40,000	40,000	.00488	.00046	.00290	.00172	
41,000	41,000	.00538	.00050			
42,000	42,000	.00588	.00050			
43,000	43,000	.00650	.00062			
44,000	44,000	.00696	.00046			
45,000	45,000	.00762	.00066	.00524	.00232	
46,000	46,000	.00820	.00058			
47,000	47,000	.00880	.00060			
48,000	48,000	.00940	.00060			
49,000	49,000	.01010	.00070			
50,000	50,000	.01120	.00110	.00860	.00336	
60,650	60,650					Ultimate strength.

Failed by triple flexure.

No. 1027.

Marks, $\genfrac{}{}{0pt}{}{^{12}\mathrm{M\,R_{18}\,T\,R_{1}}}{\mathrm{M\,T_{36}}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00044	.00006	.00004	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00068	.00004	.00006	.00002	
16,000	16,000	.00074	.00006	....	....	
17,000	17,000	.00078	.00004	....	....	
18,000	18,000	.00082	.00004	....	....	
19,000	19,000	.00088	.00006	....	....	
20,000	20,000	.00094	.00006	.00010	.00004	
21,000	21,000	.00100	.00006	....	....	
22,000	22,000	.00106	.00006	....	....	
23,000	23,000	.00112	.00006	....	....	
24,000	24,000	.00120	.00008	....	....	
25,000	25,000	.00126	.00006	.00018	.00008	
26,000	26,000	.00132	.00006	....	....	
27,000	27,000	.00138	.00006	....	....	
28,000	28,000	.00148	.00010	....	....	
29,000	29 000	.00158	.00010	....	....	
30,000	30,000	.00166	.00008	.00032	.00014	
31,000	31,000	.00178	.00012	....	....	
32,000	32,000	.00188	.00010	....	....	
33,000	33,000	.00206	.00018	....	....	
34,000	34,000	.00218	.00012	....	....	
35,000	35,000	.00240	.00022	.00078	.00046	
36,000	36,000	.00264	.00024	....	....	
37,000	37,000	.00300	.00036	....	....	
38,000	38,000	.00350	.00050	....	....	
39,000	39,000	.00376	.00026	....	....	
40,000	40,000	.00414	.00038	.00230	.00152	
41,000	41,000	.00470	.00056	....	....	
42,000	42,000	.00518	.00048	....	....	
43,000	43,000	.00572	.00054	....	....	
44,000	44,000	.00624	.00052	....	....	
45,000	45,000	.00688	.00064	.00480	.00250	
46,000	46,000	.00758	.00070	....	....	
47,000	47,000	.00800	.00042	....	....	
48,000	48,000	.00860	.00060	....	....	
49,000	49,000	.00930	.00070	....	....	
50,000	50,000	.01000	.00070	.00758	.00278	
56,620	56,620	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 11.

No. 4586.

Marks, $^{12}\frac{M\ R_1}{B\ T_1}$ $T\ R_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000205	.000055	.000005	.000005	
6,000	6,000	.000255	.000050	....	....	
7,000	7,000	.000305	.000050	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000415	.000055	....	....	
10,000	10,000	.000480	.000065	.000030	.000025	
11,000	11,000	.000550	.000070	....	....	
12,000	12,000	.000605	.000055	.000045	.000015	
13,000	13,000	.000680	.000075	....	....	
14,000	14,000	.000755	.000075	.000075	.000030	
15,000	15,000	.000835	.000080	....	....	
16,000	16,000	.000910	.000075	.000110	.000035	
17,000	17,000	.001005	.000095	....	....	
18,000	18,000	.001095	.000090	.000170	.000060	
19,000	19,000	.001210	.000115	....	....	
20,000	20,000	.001335	.000125	.000285	.000115	
21,000	21,000	.001465	.000130	....	....	
22,000	22,000	.001640	.000175	.000440	.000155	
23,000	23,000	.001850	.000210	....	....	
24,000	24,000	.002060	.000210	.000710	.000270	
25,000	25,000	.002450	.000390	.001000	.000290	
29,340	29,340	....	....	....	....	Tensile strength.

Fractured 1″ from neck. Appearance, uniform, granular.

No. 4587.

Marks, $^{12\,M\,B_{11}\,T\,B_{1}}_{\quad M\,T_{1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0	0	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000090	.000045	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0	....	
6,000	6,000	.000235	.000045	....	....	
7,000	7,000	.000285	.000050	....	....	
8,000	8,000	.000335	.000050	....	....	
9,000	9,000	.000385	.000050	....	....	
10,000	10,000	.000435	.000050	.000010	.000010	
11,000	11,000	.000495	.000060	....	....	
12,000	12,000	.000550	.000055	.000030	.000020	
13,000	13,000	.000620	.000070	....	....	
14,000	14,000	.000680	.000060	.000050	.000020	
15,000	15,000	.000745	.000065	....	....	
16,000	16,000	.000810	.000065	.000085	.000035	
17,000	17,000	.000890	.000080	....	....	
18,000	18,000	.000960	.000070	.000130	.000045	
19,000	19,000	.001000	.000100	....	....	
20,000	20,000	.001155	.000095	.000195	.000065	
21,000	21,000	.001260	.000105	....	....	
22,000	22,000	.001390	.000130	.000300	.000105	
23,000	23,000	.001540	.000150	....	....	
24,000	24,000	.001675	.000135	.000455	.000155	
25,000	25,000	.001900	.000225	.000605	.000150	
27,590	27,590	....	....	....	....	Tensile strength.

Fractured ¾″ from neck. Appearance, uniform, granular.

No. 995.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{11}\,\mathrm{T}\,\mathrm{R}_2}_{\mathrm{B}\,\mathrm{T}_2}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00038	.00006	....	....	
9,000	9,000	.00042	.00004	....	....	
10,000	10,000	.00048	.00006	.00004	.00004	
11,000	11,000	.00052	.00004	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00066	.00008	....	....	
14,000	14,000	.00072	.00006	....	....	
15,000	15,000	.00078	.00006	.00008	.00004	
16,000	16,000	.00086	.00008	....	....	
17,000	17,000	.00092	.00006	....	....	
18,000	18,000	.00096	.00004	....	....	
19,000	19,000	.00104	.00008	....	....	
20.000	20,000	.00110	.00006	.00012	.00004	
21,000	21,000	.00116	.00006	....	....	
22,000	22,000	.00122	.00006	....	....	
23,000	23,000	.00132	.00010	....	....	
24,000	24,000	.00142	.00010	....	....	
25,000	25,000	.00150	.00008	.00022	.00010	
26,000	26,000	.00156	.00006	....	....	
27,000	27,000	.00166	.00010	....	....	
28,000	28,000	.00176	.00010	....	....	
29,000	29,000	.00190	.00014	....	....	
30,000	30.000	.00208	.00018	.00056	.00034	
31,000	31,600	.00222	.00014	....	....	
32,000	32,000	.00240	.00018	....	....	
33,000	33,000	.00266	.00026	....	....	
34,000	34,000	.00290	.00024	....	....	
35,000	35,000	.00324	.00034	.00150	.00094	
36,000	36,000	.00358	.00034	....	....	
37,000	37,000	.00386	.00028	....	....	
38,000	38,000	.00426	.00040	....	....	
39,000	39.000	.00474	.00048	....	....	
40,000	40,000	.00532	.00058	.00334	.00184	
41,000	41,000	.00576	.00044	....	....	
42,000	42,000	.00620	.00044	....	....	
43,000	43,000	.00676	.00056	....	....	
44,000	44,000	.00740	.00064	....	....	
45,000	45,000	.00798	.00058	.00460	.00126	
46,000	46,000	.00860	.00062	....	....	
47,000	47,000	.00916	.00056	....	....	
48,000	48,000	.00994	.00078	....	....	
49,000	49,000	.01076	.00082	....	....	
50,000	50,000	.01174	.00098	.00910	.00450	
60,020	60,020	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 996.

Marks $\begin{smallmatrix}12\,M\,R_{11}\,T\,R_{8}\\ B\,R_{10}\end{smallmatrix}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00044	.00004	0.	....	
11,000	11,000	.00048	.00004	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00004	.00004	
16,000	16,000	.00076	.00004	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00100	.00006	.00008	.00004	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00114	.00008	....	....	
23,000	23,000	.00120	.00006	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00136	.00008	.00022	.00014	
26,000	26,000	.00150	.00014	....	....	
27,000	27,000	.00160	.00010	....	....	
28,000	28,000	.00170	.00010	....	....	
29,000	29,000	.00180	.00010	....	....	
30,000	30,000	.00196	.00016	.00050	.00028	
31,000	31,000	.00214	.00018	....	....	
32,000	32,000	.00232	.00018	....	....	
33,000	33,000	.00256	.00024	....	....	
34,000	34,000	.00286	.00030	....	....	
35,000	35,000	.00318	.00032	.00148	.00098	
36,000	36,000	.00346	.00028	....	....	
37,000	37,000	.00384	.00038	....	....	
38,000	38,000	.00424	.00040	....	....	
39,000	39,000	.00480	.00056	....	....	
40,000	40,000	.00524	.00044	.00334	.00186	
41,000	41,000	.00580	.00056	....	....	
42,000	42,000	.00620	.00040	....	....	
43,000	43,000	.00680	.00060	....	....	
44,000	44,000	.00732	.00052	....	....	
45,000	45,000	.00812	.00080	.00580	.00246	
46,000	46,000	.00860	.00048	....	....	
47,000	47,000	.00918	.00058	....	....	
48,000	48,000	.00998	.00080	....	....	
49,000	49,000	.01070	.00072	....	....	
50,000	50,000	.01136	.00066	.00882	.00302	
61,660	61,660	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 997.

Marks, $\genfrac{}{}{0pt}{}{12\,M\,R_{11}\,T\,R_1}{M\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	.00004	.00002	
11,000	11,000	.00046	.00004	....	....	
12,000	12,000	.00052	.00006	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00062	.00004	....	....	
15,000	15,000	.00068	.00006	.00004	0.	
16,000	16,000	.00074	.00006	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00098	.00006	.00008	.00004	
21,000	21,000	.00102	.00004	....	....	
22,000	22,000	.00110	.00008	....	....	
23,000	23,000	.00114	.00004	....	....	
24,000	24,000	.00120	.00006	....	....	
25,000	25,000	.00130	.00010	.00016	.00008	
26,000	26,000	.00136	.00006	....	....	
27,000	27,000	.00146	.00010	....	....	
28,000	28,000	.00158	.00012	....	....	
29,000	29,000	.00172	.00014	....	....	
30,000	30,000	.00180	.00008	.00042	.00026	
31,000	31,000	.00194	.00014	....	....	
32,000	32,000	.00212	.00018	....	....	
33,000	33,000	.00236	.00024	....	....	
34,000	34,000	.00256	.00020	....	....	
35,000	35,000	.00286	.00030	.00126	.00084	
36,000	36,000	.00320	.00034	....	....	
37,000	37,000	.00350	.00030	....	....	
38,000	38,000	.00390	.00040	....	....	
39,000	39,000	.00436	.00046	....	....	
40,000	40,000	.00490	.00054	.00302	.00176	
41,000	41,000	.00546	.00056	....	....	
42,000	42,000	.00590	.00044	....	....	
43,000	43,000	.00646	.00056	....	....	
44,000	44,000	.00682	.00036	....	....	
45,000	45,000	.00736	.00054	.00518	.00216	
46,000	46,000	.00796	.00060	....	....	
47,000	47,000	.00840	.00044	....	....	
48,000	48,000	.00866	.00026	....	....	
49,000	49,000	.00904	.00038	....	....	
50,000	50,000	.00936	.00032	.00704	.00186	
58,500	58,500	....	....	....	....	Ultimate strength.

Failed by triple flexure.

Body No. 12 (third casting).

No. 4600.

Marks, $\genfrac{}{}{0pt}{}{^{12}\mathrm{M\ R_{12}\ T\ R_{3}}}{\mathrm{B\ T_{21}}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000160	.000055	....	....	
5,000	5,000	.000205	.000045	0.	....	
6,000	6,000	.000255	.000050	....	....	
7,000	7,000	.000305	.000050	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000420	.000060	....	....	
10,000	10,000	.000485	.000065	.000010	.000010	
11,000	11,000	.000540	.000055	....	....	
12,000	12,000	.000600	.000060	.000030	.000020	
13,000	13,000	.000660	.000060	....	....	
14,000	14,000	.000740	.000080	.000045	.000015	
15,000	15,000	.000810	.000070	....	....	
16,000	16,000	.000895	.000085	.000090	.000045	
17,000	17,000	.000990	.000095	....	....	
18,000	18,000	.001095	.000105	.000155	.000065	
19,000	19,000	.001205	.000110	....	....	
20,000	20,000	.001340	.000135	.000260	.000105	
21,000	21,000	.001485	.000145	....	....	
22,000	22,000	.001660	.000175	.000455	.000195	
23,000	23,000	.001900	.0002[illegible]	....	....	
24,000	24,000	.002150	.000250	.000800	.000345	
25,000	25,000	.002550	.000400	.001090	.000290	
28,530	28,530	....	....	....	....	Tensile strength.

Fractured at middle of stem. Appearance, uniform, granular.

No. 4601.

Marks, $^{12\,M\,R_{12}\,T\,R_2}_{M\,T_{21}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000090	.000045	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000240	.000050	....	....	
7,000	7,000	.000290	.000050	....	....	
8,000	8,000	.000340	.000050	....	....	
9,000	9,000	.000390	.000050	....	....	
10,000	10,000	.000445	.000055	0.	....	
11,000	11,000	.000495	.000050	....	....	
12,000	12,000	.000555	.000060	.000015	.000015	
13,000	13,000	.000610	.000055	....	....	
14,000	14,000	.000670	.000060	.000035	.000020	
15,000	15,000	.000740	.000070	....	....	
16,000	16,000	.000805	.000065	.000055	.000020	
17,000	17,000	.000885	.000080	....	....	
18,000	18,000	.000955	.000070	.000095	.000040	
19,000	19,000	.001040	.000085	....	....	
20,000	20,000	.001125	.000085	.000145	.000050	
21,000	21,000	.001230	.000105	....	....	
22,000	22,000	.001340	.000110	.000245	.000100	
23,000	23,000	.001485	.000145	....	....	
24,000	24,000	.001650	.000165	.000415	.000170	
25,000	25,000	.001825	.000175	.000535	.000120	
28,020	28,020	....	....	....	....	Tensile strength.

Fractured at middle of stem. Appearance, uniform, granular.

No. 1010.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{11}\,\mathrm{T}\,\mathrm{R}_{3}}_{\mathrm{B}\,\mathrm{T}_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00008	.00008	....	....	
3,000	3,000	.00012	.00004	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00024	.00008	0.	....	
6,000	6,000	.00030	.00006	....	....	
7,000	7,000	.00034	.00004	....	....	
8,000	8,000	.00038	.00004	....	....	
9,000	9,000	.00044	.00006	....	....	
10,000	10,000	.00050	.00006	.00004	.00004	
11,000	11,000	.00054	.00004	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00072	.00006	....	....	
15,000	15,000	.00078	.00006	.00006	.00002	
16,000	16,000	.00084	.00006	....	....	
17,000	17,000	.00090	.00006	....	....	
18,000	18,000	.00096	.00006	....	....	
19.000	19.000	.00104	.00008	....	....	
20,000	20,000	.00110	.00006	.00016	.00010	
21,000	21,000	.00118	.00008	....	....	
22,000	22,000	.00124	.00006	....	....	
23,000	23,000	.00134	.00010	....	....	
24,000	24,000	.00142	.00008	....	....	
25,000	25,000	.00152	.00010	.00034	.00018	
26,000	26,000	.00164	.00012	....	....	
27,000	27,000	.00174	.00010	....	....	
28,000	28,000	.00188	.00014	....	....	
29,000	29,050	.00204	.00016	....	....	
30,000	30,000	.00222	.00018	.00068	.00034	
31,000	31,000	.00244	.00022	....	....	
32,000	32,000	.00264	.00020	....	....	
33,000	33,000	.00288	.00024	....	....	
34,000	34,000	.00326	.00038	....	....	
35,000	35,000	.00366	.00040	.00176	.00108	
36,000	36,000	.00404	.00038	....	....	
37,000	37,000	.00448	.00044	....	....	
38,000	38,000	.00492	.00044	....	....	
39,000	39,000	.00548	.00056	....	....	
40,000	40,000	.00592	.00044	.00376	.00200	
41,000	41,000	.00660	.00068	....	....	
42,000	42,000	.00700	.00040	....	....	
43,000	53,000	.00750	.00050	....	....	
44,000	44,000	.00834	.00084	....	....	
45,000	45,000	.00904	.00070	.00600	.00284	
59,060	59,060	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1011.

Marks, $\genfrac{}{}{0pt}{}{12\,M\,R_{12}\,T\,R_{2}}{B\,R_{30}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	,00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13.000	.00058	.00004	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00070	.00006	.00006	.00004	
16,000	16,000	.00074	.00004	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00088	.00008	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00102	.00008	.00008	.00002	
21,000	21.000	.00108	.00006	....	....	
22,000	22.000	.00114	.00006	....	....	
23,000	23.000	.00120	.00006	....	....	
24,000	24,000	.00130	.00010	....	....	
25,000	25,000	.00138	.00008	.00024	.00016	
26,000	26,000	.00152	.00014	....	....	
27,000	27,000	.00164	.00012	....	....	
28,000	28,000	.00172	.00008	....	....	
29,000	29,000	.00180	.00008	....	....	
30,000	30,000	.00196	.00016	.00050	.00026	
31,000	31,000	.00218	.00022	....	....	
32,000	32,000	.00256	.00038	....	....	
33,000	33,000	.00284	.00028	....	....	
34,000	34,000	.00302	.00018	....	....	
35,000	85,000	.00324	.00022	.00070	.00020	
36,000	36,000	.00372	.00048	....	....	
87,000	37,000	.00414	.00042	....	....	
38,000	38,000	.00452	.00038	....	....	
39,000	39,000	.00492	.00040	....	....	
40,000	40,000	.00564	.00072	.00168	.00098	
41,000	41,000	.00600	.00036	....	....	
42,000	42,000	.00640	.00040	....	....	
43,000	43,000	.00690	.00050	....	....	
44.000	44,000	.00756	.00066	....	....	
45,000	45,000	.00808	.00052	.00580	.00412	
46,000	46,000	.00860	.00052	....	....	
47,000	47,000	.00890	.00030	....	....	
48,000	48,000	.00920	.00030	....	....	
49,000	49,000	.00958	.00038	....	....	
50,000	50,000	.01004	.00046	.00760	.00180	
58,200	58,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1012.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{12}\,\mathrm{T}\,\mathrm{R}_{1}}_{\mathrm{M}\,\mathrm{T}_{22}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00004	.00002	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00056	.00004	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00070	.00006	.00004	0.	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00080	.00004	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00098	.00006	.00008	.00004	
21,000	21,000	.00108	.00010	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00136	.00006	.00022	.00014	
26,000	26,000	.00148	.00012	....	....	
27,000	27,000	.00154	.00006	....	....	
28,000	28,000	.00164	.00010	....	....	
29,000	29,000	.00174	.00010	....	....	
30,000	30,000	.00188	.00014	.00040	.00018	
31,000	31,000	.00202	.00014	....	....	
32,000	32,000	.00216	.00014	....	....	
33,000	33,000	.00234	.00018	....	....	
34,000	34,000	.00254	.00020	....	....	
35,000	35,000	.00280	.00026	.00110	.00070	
36,000	36,000	.00310	.00030	....	....	
37,000	37,000	.00330	.00020	....	....	
38,000	38,000	.00386	.00056	....	....	
39,000	39,000	.00430	.00044	....	....	
40,000	40,000	.00480	.00050	.00270	.00160	
41,000	41,000	.00520	.00040	....	....	
42,000	42,000	.00560	.00040	....	....	
43,000	43,000	.00604	.00044	....	....	
44,000	44,000	.00650	.00046	....	....	
45,000	45,000	.00694	.00044	.00480	.00210	
46,000	46,000	.00750	.00056	....	....	
47,000	47,000	.00792	.00042	....	....	
48,000	48,000	.00834	.00042	....	....	
49,000	49,000	.00870	.00036	....	....	
50,000	50,000	.00910	.00040	.00680	.00200	
58,500	58,500	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 12 (fourth casting).

No. 4626.

Marks, $\genfrac{}{}{0pt}{}{12\ M\ R_{12}\ T\ R_{6}}{B\ T_{31}}$
Diameter, 1″.129.
Sectional area 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000155	.000050	....	....	
5,000	5,000	.000210	.000055	0.	....	
6,000	6,000	.000265	.000055	....	....	
7,000	7,000	.000315	.000050	....	....	
8,000	8,000	.000370	.000055	....	....	
9,000	9,000	.000425	.000055	....	....	
10,000	10,000	.000475	.000050	.000015	.000015	
11,000	11,000	.000530	.000055	....	....	
12,000	12,000	.000585	.000055	.000025	.000010	
13,000	13,000	.000660	.000075	....	....	
14,000	14,000	.000725	.000065	.000060	.000035	
15,000	15,000	.000800	.000075	....	....	
16,000	16,000	.000875	.000075	.000080	.000020	
17,000	17,000	.000960	.000085	....	....	
18,000	18,000	.001050	.000090	.000135	.000055	
19,000	19,000	.001135	.000085	....	....	
20,000	20,000	.001230	.000095	.000200	.000065	
21,000	21,000	.001340	.000110	....	....	
22,000	22,000	.001475	.000135	.000315	.000115	
23,000	23,000	.001625	.000150	....	....	
24,000	24,000	.001790	.000165	.000525	.000210	
25,000	25,000	.002080	.000290	.000700	.000175	
29,890	29,890	....	....	....	....	Tensile strength.

Fractured 9″.6 from neck. Appearance, granular.

No. 4627.

Marks, $\frac{12\ \text{M R}_{12}\ \text{T R}_{1}}{\text{M T}_{21}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000095	.000050	....	....	
4,000	4,000	.000145	.000050	....	....	
5,000	5,000	.000195	.000050	0.	....	
6,000	6,000	.000245	.000050	....	....	
7,000	7,000	.000295	.000050	....	....	
8,000	8,000	.000345	.000050	....	....	
9,000	9,000	.000395	.000050	....	....	
10,000	10,000	.000450	.000055	.000015	.000015	
11,000	11,000	.000515	.000065	....	....	
12,000	12,060	.000570	.000055	.000035	.000020	
13,000	13,000	.000635	.009065	....	....	
14,000	14,000	.000695	.000060	.000045	.000010	
15,000	15,000	.000750	.000055	....	....	
16,000	16,000	.000820	.000070	.000075	.000030	
17,000	17,000	.000895	.000075	....	....	
18,000	18,000	.000955	.000060	.000105	.000030	
19,000	19,000	.001045	.000090	....	....	
20,000	20,000	.001135	.000090	.000160	.000055	
21,000	21,000	.001240	.000105	....	....	
22,000	22,000	.001340	.000100	.000255	.000095	
23,000	23,000	.001480	.000140	....	....	
24,000	24,000	.001600	.000120	.000390	.000135	
25,000	25,000	.001775	.000175	.000500	.000110	
29,250	29,250	....	....	....	....	Tensile strength.

Fractured ¾″ from neck. Appearance, granular.

No. 1028.

Marks, $12\ \begin{smallmatrix} M\,R_{12}\,T\,R_3 \\ B\,T_{28} \end{smallmatrix}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00020	.00004	....	....	
7,000	7,000	.00026	.00006	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9,000	.00034	.00004	....	....	
10,000	10,000	.00040	.00006	0.	....	
11,000	11,000	.00044	.00004	....	....	
12,000	12,000	.00048	.00004	....	....	
13,000	13,000	.00052	.00004	....	....	
14,000	14,000	.00058	.00006	....	....	
15,000	15,000	.00064	.00006	0.	....	
16,000	16,000	.00068	.00004	....	....	
17,000	17,000	.00072	.00004	....	....	
18,000	18,000	.00078	.00006	....	....	
19,000	19,000	.00084	.00006	....	....	
20,000	20,000	.00092	.00008	.00004	.00004	
21,000	21,000	.00098	.00006	....	....	
22,000	22,000	.00104	.00006	....	....	
23,000	23,000	.00110	.00006	....	....	
24,000	24,000	.00116	.00006	....	....	
25,000	25,000	.00124	.00008	.00014	.00010	
26,000	26,000	.00132	.00008	....	....	
27,000	27,000	.00142	.00010	....	....	
28,000	28,000	.00152	.00010	....	....	
29,000	29.000	.00160	.00008	....	....	
30,000	30,000	.00172	.00012	.00036	.00022	
31,000	31,000	.00186	.00014	....	....	
32,000	32,000	.00208	.00022	....	....	
33,000	33,000	.00222	.00014	....	....	
34,000	34,000	.00242	.00020	....	....	
35,000	35,000	.00272	.00030	.00104	.00068	
36,000	36,000	.00306	.00034	....	....	
37,000	37,000	.00338	.00032	....	....	
38,000	38,000	.00384	00046	....	....	
39.000	39,000	.00412	.00028	....	....	
40,000	40,000	.00456	.00044	.00264	.00160	
41,000	41,000	.00500	.00044	....	....	
42,000	42,000	.00548	.00048	....	....	
43,000	43,000	.00604	.00056	....	....	
44,000	44,000	.00646	.00042	....	....	
45,000	45,000	.00712	.00066	.00488	.00224	
46,000	46,000	.00758	.00046	....	....	
47,000	47,000	.00806	.00048	....	....	
48,000	48,000	.00882	.00076	....	....	
49,000	49,000	.00924	.00042	....	....	
50,000	50,000	.00980	.00056	.00724	.00236	
64,460	64,460	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1029.

Marks, $12\ M\ R_{12}\ T\ R_{3}$
$B\ R_{56}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00020	.00004	.00002	.00002	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00044	.00006	.00004	.00002	
11,000	11,000	.00048	.00004	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00058	.00004	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00070	.00006	.00006	.00002	
16,000	16,000	.00074	.00004	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00096	.00004	.00012	.00006	
21,000	21,000	.00104	.00008	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00114	.00004	....	....	
24,000	24,000	.00120	.00006	....	....	
25,000	25,000	.00130	.00010	.00020	.00008	
26,000	26,000	.00134	.00004	....	....	
27,000	27,000	.00140	.00006	....	....	
28,000	28,000	.00150	.00010	....	....	
29,000	29,000	.00156	.00006	....	....	
30,000	30,000	.00172	.00016	.00036	.00016	
31,000	31,000	.00192	.00020	....	....	
32,000	32,000	.00210	.00018	....	....	
33,000	33,000	.00236	.00026	....	....	
34,000	34,000	.00252	.00016	....	....	
35,000	35,000	.00276	.00024	.00114	.00078	
36,000	36,000	.00316	.00040	....	....	
37,000	37,000	.00352	.00036	....	....	
38,000	38,000	.00384	.00032	....	....	
39,000	39,000	.00430	.00046	....	....	
40,000	40,000	.00480	.00050	.00290	.00176	
41,000	41,000	.00530	.00050	....	....	
42,000	42,000	.00564	.00034	....	....	
43,000	43,000	.00600	.00036	....	....	
44,000	44,000	.00652	.00052	....	....	
45,000	45,000	.00706	.00054	.00486	.00196	
46,000	46,000	.00754	.00048	....	....	
47,000	47,000	.00814	.00060	....	....	
48,000	48,000	.00868	.00054	....	....	
49,000	49,000	.00914	.00046	....	....	
50,000	50,000	.00972	.00058	.00722	.00236	
64,170	64,170	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1030.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{12}\,\mathrm{T}\,\mathrm{R}_{1}}_{\mathrm{M}\,\mathrm{T}_{22}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00016	.00006			
5,000	5,000	.00020	.00004	0.		
6,000	6,000	.00024	.00004			
7,000	7,000	.00028	.00004			
8,000	8,000	.00032	.00004			
9,000	9,000	.00036	.00004			
10,000	10,000	.00042	.00006	.00002	.00002	
11,000	11,000	.00048	.00006			
12,000	12,000	.00952	.00004			
13,000	13,000	.00056	.00004			
14,000	14,000	.00062	.00006			
15,000	15,000	.00068	.00006	.00006	.00004	
16,000	16,000	.00074	.00006			
17,000	17,000	.00080	.00006			
18,000	18,000	.00086	.00006			
19,000	19,000	.00092	.00006			
20,000	20,000	.00096	.00004	.00010	.00004	
21,000	21,000	.00102	.00006			
22,000	22,000	.00110	.00008			
23,000	23,000	.00116	.00006			
24,000	24,000	.00124	.00008			
25,000	25,000	.00132	.00008	.00020	.00010	
26,000	26,000	.00140	.00008			
27,000	27,000	.00148	.00008			
28,000	28,000	.00158	.00010			
29,000	29,000	.00170	.00012			
30,000	30,000	.00184	.00014	.00044	.00024	
31,000	31,000	.00196	.00012			
32,000	32,000	.00212	.00016			
33,000	33,000	.00232	.00020			
34,000	34,000	.00252	.00020			
35,000	35,000	.00278	.00026	.00116	.00072	
36,000	36,000	.00296	.00018			
37,000	37,000	.00332	.00036			
38,000	38,000	.00368	.00036			
39,000	39,000	.00410	.00042			
40,000	40,000	.00464	.00054	.00270	.00154	
41,000	41,000	.00504	.00040			
42,000	42,000	.00558	.00054			
43,000	43,000	.00506	.00038			
44,000	44,000	.00654	.00058			
45,000	45,000	.00720	.00066	.00498	.00228	
46,000	46,000	.00768	.00048			
47,000	47,000	.00800	.00032			
48,000	48,000	.00856	.00056			
49,000	49,000	.00924	.00068			
50,000	50,000	.00988	.00064	.00734	.00236	
64,220	64,220					Ultimate strength.

Failed by triple flexure.

BODY NO. 13.

No. 4596.

Marks, $^{12}M\,R_{18}\,T\,R_{6}$ $B\,T_{1}$
Diameter, 1″.112.
Sectional area, ″.97 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
970	1,000	0.	0.	0.	0.	Initial load.
1,940	2,000	.000055	.000055	....	....	
2,910	3,000	.000095	.000040	....	....	
3,880	4,000	.000160	.000065	....	....	
4,850	5,000	.000205	.000045	.0	....	
5,820	6,000	.000265	.000060	....	....	
6,790	7,000	.000320	.000055	....	....	
7,760	8,000	.000380	.000060	....	....	
8,730	9,000	.000435	.000055	....	....	
9,700	10,000	.000495	.000060	.000025	.000025	
10,670	11,000	.000555	.000060	....	....	
11,640	12,000	.000630	.000075	.000050	.000025	
12,610	13,000	.000690	.000060	....	....	
13,580	14,000	.000765	.000075	.000080	.000030	
14,550	15,000	.000840	.000075	....	....	
15,520	16,000	.000930	.000090	.000110	.000030	
16,490	17,000	.001010	.000080	....	....	
17,460	18,000	.001110	.000100	.000170	.000060	
18,430	19,000	.001210	.000100	....	....	
19,400	20,000	.001340	.000130	.000320	.000150	
20,370	21,000	.001470	.000130	....	....	
21,340	22,000	.001610	.000140	.000405	.000085	
22,310	23,000	.001800	.000190	....	....	
23,280	24,000	.002040	.000240	.000675	.000270	
24,250	25,000	.002330	.000290	.000875	.000200	Tensile strength.

Fractured 6″.9 from neck. Appearance, uniform, granular.

No. 4597.

Marks, $\genfrac{}{}{0pt}{}{12\,M\,R_{12}\,T\,B_1}{M\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000145	.000045	....	....	
5,000	5,000	.000195	.000050	0.	....	
6,000	6,000	.000250	.000055	....	....	
7,000	7,000	.000305	.000055	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000410	.000050	....	....	
10,000	10,000	.000470	.000060	.000015	.000015	
11,000	11,000	.000520	.000050	....	....	
12,000	12,000	.000580	.000060	.000035	.000020	
13,000	13,000	.000640	.000060	....	....	
14,000	14,000	.000705	.000065	.000040	.000005	
15,000	15,000	.000770	.000065	....	....	
16,000	16,000	.000845	.000075	.000060	.000020	
17,000	17,000	.000910	.000065	....	....	
18,000	18,000	.000985	.000075	.000095	.000035	
19,000	19,000	.001100	.000115	....	....	
20,000	20,000	.001225	.000125	.000195	.000100	
20,840	20,840	....	....	....	....	Tensile strength.

Fractured at middle of stem. Appearance, granular, with coarse dark spangles.

No. 1004.

Marks, $^{12\,M\,R_{12}\,T\,R_2}_{B\,T_3}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	.00004	.00004	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00036	.00004	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00046	.00004	.00004	0.	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00060	.00008	....	....	
13,000	13,000	.00064	.00004	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00074	.00004	.00012	.00008	
16,000	16,000	.00078	.00004	....	....	
17,000	17,000	.00086	.00008	....	....	
18,000	18,000	.00092	.00006	....	....	
19,000	19,000	.00096	.00004	....	....	
20,000	20,000	.00102	.00006	.00016	.00004	
21,000	21,000	.00110	.00008	....	....	
22,000	22,000	.00116	.00006	....	....	
23,000	23,000	.00124	.00008	....	....	
24,000	24,000	.00130	.00006	....	....	
25,000	25,000	.00138	.00008	.00022	.00006	
26,000	26,000	.00150	.00012	....	....	
27,000	27,000	.00158	.00008	....	....	
28,000	28,000	.00168	.00010	....	....	
29,000	29,000	.00172	.00004	....	....	
30,000	30,000	.00184	.00012	.00050	.00028	
31,000	31,000	.00202	.00018	....	....	
32,000	32,000	.00216	.00014	....	....	
33,000	33,000	.00230	.00014	....	....	
34,000	34,000	.00258	.00028	....	....	
35,000	35,000	.00288	.00030	.00104	.00054	
36,000	36,000	.00320	.00032	....	....	
37,000	37,000	.00348	.00028	....	....	
38,000	38,000	.00388	.00040	....	....	
39,000	39,000	.00428	.00040	....	....	
40,000	40,000	.00468	.00040	.00288	.00184	
41,000	41,000	.00534	.00066	....	....	
42,000	42,000	.00580	.00046	....	....	
43,000	43,000	.00650	.00070	....	....	
44,000	44,000	.00710	.00060	....	....	
45,000	45,000	.00776	.00066	.00540	.00252	
46,000	46,000	.00854	.00078	....	....	
47,000	47,000	.00930	.00076	....	....	
48,000	48,000	.01018	.00088	....	....	
49,000	49,000	.01094	.00076	....	....	
50,000	50,000	.01176	.00082	.00938	.00398	
59,780	59,780	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1005.

Marks, $\substack{12\,\mathrm{M\,R_{13}\,T\,R_{2}} \\ \mathrm{B\,E_{10}}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00020	.00004	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00036	.00004	....	....	
9,000	9,000	.00040	.00004	....	....	
10,000	10,000	.00046	.00006	0.	....	
11,000	11,000	.00054	.00008	....	....	
12,000	12,000	.00058	.00004	....	....	
13,000	13,000	.00062	.00004	....	....	
14,000	14,000	.00070	.00008	....	....	
15,000	15,000	.00074	.00004	.00006	.00006	
16,000	16,000	.00080	.00006	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00090	.00004	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00102	.00006	.00012	.00006	
21,000	21,000	.00110	.00008	....	....	
22,000	22,000	.00118	.00008	....	....	
23,000	23,000	.00124	.00006	....	....	
24,000	24,000	.00132	.00008	....	....	
25,000	25,000	.00138	.00006	.00022	.00010	
26,000	26,000	.00148	.00010	....	....	
27,000	27,000	.00154	.00006	....	....	
28,000	28,000	.00162	.00008	....	....	
29,000	29,000	.00172	.00010	....	....	
30,000	30,000	.00184	.00012	.00044	.00022	
31,000	31,000	.00204	.00020	....	....	
32,000	32,000	.00220	.00016	....	....	
33,000	33,000	.00244	.00024	....	....	
34,000	34,000	.00264	.00020	....	....	
35,000	35,000	.00294	.00030	.00130	.00086	
36,000	36,000	.00328	.00034	....	....	
37,000	37,000	.00358	.00030	....	....	
38,000	38,000	.00398	.00040	....	....	
39,000	39,000	.00444	.00046	....	....	
40,000	40,000	.00474	.00030	.00300	.00170	
41,000	41,000	.00532	.00058	....	....	
42,000	42,000	.00586	.00054	....	....	
43,000	43,000	.00634	.00048	....	....	
44,000	44,000	.00676	.00042	....	....	
45,000	45,000	.00726	.00050	.00510	.00210	
46,000	46,000	.00786	.00060	....	....	
47,000	47,000	.00820	.00034	....	....	
48,000	48,000	.00854	.00034	....	....	
49,000	49,000	.00886	.00032	....	....	
50,000	50,000	.00908	.00022	.00670	.00160	
59,580	59,580	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1006.

Marks, $\overset{12\,M\,R_{12}\,T\,R_1}{M\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	......	......	
3,000	3,000	.00010	.00004	......	......	
4,000	4,000	.00016	.00006	......	......	
5,000	5,000	.00020	.00004	0.	......	
6,000	6,000	.00024	.00004	......	......	
7,000	7,000	.00030	.00006	......	......	
8,000	8,000	.00034	.00004	......	......	
9,000	9,000	.00038	.00004	......	......	
10,000	10,000	.00044	.00006	0.	......	
11,000	11,000	.00050	.00006	......	......	
12,000	12,000	.00056	.00006	......	......	
13,000	13,000	.00062	.00006	......	......	
14,000	14,000	.00068	.00006	......	......	
15,000	15,000	.00076	.00008	.00004	.00004	
16,000	16,000	.00080	.00004	......	......	
17,000	17,000	.00088	.00008	......	......	
18,000	18,000	.00094	.00006	......	......	
19,000	19,000	.00100	.00006	......	......	
20,000	20,000	.00108	.00008	.00012	.00008	
21,000	21,000	.00118	.00010	......	......	
22,000	22,000	.00124	.00006	......	......	
23,000	23,000	.00134	.00010	......	......	
24,000	24,000	.00140	.00006	......	......	
25,000	25,000	.00152	.00012	.00028	.00016	
26,000	26,000	.00164	.00012	......	......	
27,000	27,000	.00174	.00010	......	......	
28,000	28,000	.00186	.00012	......	......	
29,000	29,000	.00202	.00016	......	......	
30,000	30,000	.00222	.00020	.00072	.00044	
31,000	31,000	.00252	.00030	......	......	
32,000	32,000	.00270	.00018	......	......	
33,000	33,000	.00290	.00020	......	......	
34,000	34,000	.00318	.00028	......	......	
35,000	35,000	.00366	.00048	.00186	.00114	
36,000	36,000	.00420	.00054	......	......	
37,000	37,000	.00480	.00060	......	......	
38,000	38,000	.00510	.00030	......	......	
39,000	39,000	.00560	.00050	......	......	
40,000	40,000	.00614	.00054	.00406	.00220	
41,000	41,000	.00680	.00066	......	......	
42,000	42,000	.00750	.00070	......	......	
43,000	43,000	.00834	.00084	......	......	
44,000	44,000	.00880	.00046	......	......	
45,000	45,000	.01048	.00068	.00790	.00384	
46,000	46,000	.01116	.00068	......	......	
47,000	47,000	.01200	.00084	......	......	
48,000	48,000	.01340	.00140	......	......	
49,000	49,000	.01466	.00126	......	......	
50,000	50,000	.01630	.00164	.01310	.00520	
55,000	55,000	......	......	......	......	Ultimate strength.

Failed by triple flexure.

BODY NO. 13 (second casting).

No. 4660.

Marks, $^{12\,M\,R_{13},\,T\,R_2}_{B\,T_{11}}$.
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000155	.000055	....	....	
5,000	5,000	.000205	.000050	.000010	.000010	
6,000	6,000	.000255	.000050	....	....	
7,000	7,000	.000315	.000060	....	....	
8,000	8,000	.000365	.000050	....	....	
9,000	9,000	.000430	.000065	....	....	
10,000	10,000	.000490	.000060	.000025	.000015	
11,000	11,000	.000555	.000065	....	....	
12,000	12,000	.000615	.000060	.000045	.000020	
13,000	13,000	.000680	.000065	....	....	
14,000	14,000	.000755	.000075	.000065	.000020	
15,000	15,000	.000845	.000090	....	....	
16,006	16,000	.000920	.000075	.000110	.000045	
17,000	17,000	.001010	.000090	....	....	
18,000	18,000	.001100	.000090	.000185	.000075	
19,000	19,000	.001215	.000115	....	....	
20,000	20,000	.001335	.000120	.000215	.000030	
21,000	21,000	.001460	.000125	....	....	
22,000	22,000	.001600	.000140	.000400	.000185	
23,000	23,000	.001825	.000225	....	....	
24,000	24,000	.002050	.000225	.000690	.000290	
25,000	25,000	.002310	.000260	.000885	.000195	
26,620	26,620	....	....	....	....	Tensile strength.

Fractured 4″.5 from neck. Appearance, granular.

No. 4661.

Marks, $^{12\,M\,R_{11}\,T\,R_{1}}_{M\,T_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	.000010	.000010	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000305	.000055	....	....	
8,000	8,000	.000355	.000050	....	....	
9,000	9,000	.000405	.000050	....	....	
10,000	10,000	.000460	.000055	.000040	.000030	
11,000	11,000	.000510	.000050	....	....	
12,000	12,000	.000560	.000050	.000045	.000005	
13,000	13,000	.000630	.000070	....	....	
14,000	14,000	.000695	.000065	.000060	.000015	
15,000	15,000	.000750	.000055	....	....	
16,000	16,000	.000810	.000060	.000090	.000030	
17,000	17,000	.000880	.000070	....	....	
18,000	18,000	.000950	.000070	.000105	.000015	
19,000	19,000	.001020	.000070	....	....	
20,000	20,000	.001100	.000080	.000150	.000045	
21,000	21,000	.001180	.000080	....	....	
22,000	22,000	.001265	.000085	.000210	.000000	
23,000	23,000	.001380	.000115	....	....	
24,000	24,000	.001495	.000115	.000300	.000090	
25,000	25,000	.001680	.000185	.000425	.000125	
28,450	28,450	....	....	....	....	Tensile strength.

Fractured ″.45 from neck. Appearance, granular; coarse stellar arrangement on one side of fracture.

No. 1031.

Marks, $^{12\,M\,R_{13}\,T\,R_{4}}_{\qquad B\,T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00022	.00006	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00032	.00006	....	....	
9,000	9,000	.00036	.00004	....	....	
10,000	10,000	.00042	.00006	0.	....	
11,000	11,000	.00046	.00004	....	....	
12,000	12,000	.00052	.00006	....	....	
13,000	13,000	.00056	.00004	....	....	
14,000	14,000	.00062	.00006	....	....	
15,000	15,000	.00068	.00006	.00002	.00002	
16,000	16,000	.00072	.00004	....	....	
17,000	17,000	.00078	.00006	....	....	
18,000	18,000	.00084	.00006	....	....	
19,000	19,000	.00090	.00006	....	....	
20,000	20,000	.00096	.00006	.00010	.00008	
21,000	21,000	.00104	.00008	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00118	.00008	....	....	
24,000	24,000	.00124	.00006	....	....	
25,000	25,000	.00132	.00008	.00020	.00010	
26,000	26,000	.00142	.00010	....	....	
27,000	27,000	.00152	.00010	....	....	
28,000	28,000	.00160	.00008	....	....	
29,000	29,000	.00172	.00012	....	....	
30,000	30,000	.00184	.00012	.00044	.00024	
31,000	31,000	.00200	.00016	....	....	
32,000	32,000	.00214	.00014	....	....	
33,000	33,000	.00232	.00018	....	....	
34,000	34,000	.00252	.00020	....	....	
35,000	35,000	.00286	.00034	.00120	.00076	
36,000	36,000	.00326	.00040	....	....	
37,000	37,000	.00356	.00030	....	....	
38,000	38,000	.00388	.00032	....	....	
39,000	39,000	.00434	.00046	....	....	
40,000	40,000	.00488	.00054	.00290	.00170	
41,000	41,000	.00532	.00044	....	....	
42,000	42,000	.00570	.00038	....	....	
43,000	43,000	.00626	.00056	....	....	
44,000	44,000	.00690	.00064	....	....	
45,000	45,000	.00748	.00058	.00516	.00226	
46,000	46,000	.00796	.00048	....	....	
47,000	47,000	.00836	.00040	....	....	
48,000	48,000	.00900	.00064	....	....	
49,000	49,000	.00972	.00072	....	....	
50,000	50,000	.01044	.00072	.00780	.00264	
61,500	61,500	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1032.

Marks, ^{12}M R$_{11}$ T R$_{3}$ B R$_{29}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00022	.00006	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9,000	.00036	.00006	....	....	
10,000	10,000	.00042	.00006	0.	....	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00070	.00006	.00004	.00004	
16,000	16,000	.00074	.00004	....	....	
17,000	17,000	.00078	.00004	....	....	
18,000	18,000	.00084	.00006	....	....	
19,000	19,000	.00092	.00008	....	....	
20,000	20,000	.00098	.00006	.00008	.00004	
21,000	21,000	.00104	.00006	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00118	.00008	....	....	
24,000	24,000	.00124	.00006	....	....	
25,000	25,000	.00132	.00008	.00020	.00012	
26,000	26,000	.00140	.00008	....	....	
27,000	27,000	.00150	.00010	....	....	
28,000	28,000	.00160	.00010	....	....	
29,000	29,000	.00170	.00010	....	....	
30,000	30,000	.00182	.00012	.00044	.00024	
31,000	31,000	.00200	.00018	....	....	
32,000	32,000	.00216	.00016	....	....	
33,000	33,000	.00234	.00018	....	....	
34,000	34,000	.00258	.00024	....	....	
35,000	35,000	.00292	.00034	.00124	.00080	
36,000	36,000	.00336	.00044	....	....	
37,000	37,000	.00358	.00022	....	....	
38,000	38,000	.00388	.00030	....	....	
39,000	39,000	.00436	.00048	....	....	
40,000	40,000	.00486	.00050	.00290	.00166	
41,000	41,000	.00550	.00064	....	....	
42,000	42,000	.00592	.00042	....	....	
43,000	43,000	.00648	.00056	....	....	
44,000	44,000	.00712	.00064	....	....	
45,000	45,000	.00782	.00070	.00548	.00258	
46,000	46,000	.00830	.00048	....	....	
47,000	47,000	.00872	.00042	....	....	
48,000	48,000	.00936	.00064	....	....	
49,000	49,000	.01026	.00090	....	....	
50,000	50,000	.01100	.00074	.00834	.00286	
62,800	62,800	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1033.

Marks, $^{12\,M\,R_{12}\,T\,B_1}_{\quad M\,T_{18}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00032	.00006	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00048	.00004	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00056	.00004	....	....	
14,000	14,000	.00062	.00006	....	....	
15,000	15,000	.00068	.00006	.00004	.00002	
16,000	16,000	.00074	.00006	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00098	.00006	.00008	.00004	
21,000	21,000	.00104	.00006	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00116	.00006	....	....	
24,000	24,000	.00124	.00008	....	....	
25,000	25,000	.00130	.00006	.00014	.00006	
26,000	26,000	.00138	.00008	....	....	
27,000	27,000	.00146	.00008	....	....	
28,000	28,000	.00154	.00008	....	....	
29,000	29,000	.00164	.00010	....	....	
30,000	30,000	.00174	.00010	.00032	.00018	
31,000	31,000	.00184	.00010	....	....	
32,000	32,000	.00198	.00014	....	....	
33,000	33,000	.00214	.00016	....	....	
34,000	34,000	.00234	.00020	....	....	
35,000	35,000	.00250	.00016	.00080	.00048	
36,000	36,000	.00276	.00026	....	....	
37,000	37,000	.00296	.00020	....	....	
38,000	38,000	.00324	.00028	....	....	
39,000	39,000	.00356	.00032	....	....	
40,000	40,000	.00398	.00042	.00200	.00120	
41,000	41,000	.00446	.00048	....	....	
42,000	42,000	.00476	.00030	....	....	
43,000	43,000	.00514	.00038	....	....	
44,000	44,000	.00556	.00042	....	....	
45,000	45,000	.00608	.00052	.00382	.00182	
46,000	46,000	.00650	.00042	....	....	
47,000	47,000	.00688	.00038	....	....	
48,000	48,000	.00724	.00036	....	....	
49,000	49,000	.00758	.00034	....	....	
50,000	50,000	.00782	.00024	.00540	.00158	
62,580	62,580	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 13. (Extra disk from second casting.)

No. 4670.

Marks, $\underset{\mathrm{B\,T_{11}}}{12\,\mathrm{M\,R_{11}\,T\,R_{3}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	1, 000	0.	0.	0.	0.	Initial load.
2, 000	2, 000	.000055	.000055	....	....	
3, 000	3, 000	.000105	.000050	....	....	
4, 000	4, 000	.000160	.000055	....	....	
5, 000	5, 000	.000210	.000050	.000015	.000015	
6, 000	6, 000	.000270	.000060	....	....	
7, 600	7, 000	.000335	.000065	....	....	
8, 000	8, 000	.000395	.000060	....	....	
9, 000	9, 000	.000450	.000055	....	....	
10, 000	10, 000	.000505	.000055	.000040	.000025	
11, 000	11, 000	.000575	.000070	....	....	
12, 000	12, 000	.000640	.000065	.000055	.000015	
13, 000	13, 000	.000705	.000065	....	....	
14, 000	14, 000	.000775	.000070	.000090	.000045	
15, 000	15, 000	.000850	.000075	....	....	
16, 000	16, 000	.000940	.000090	.000115	.000025	
17, 000	17, 000	.001025	.000085	....	....	
18, 000	18, 000	.001110	.000085	.000160	.000045	
19, 000	19, 000	.001215	.000105	....	....	
20, 000	20, 000	.001345	.000130	.000255	.000095	
21, 000	21, 000	.001455	.000110	....	....	
22, 000	22, 000	.001600	.000145	.000360	.000105	
23, 000	23, 000	.001785	.000185	....	....	
24, 000	24, 000	.001955	.000170	.000595	.000235	
25, 000	25, 000	.002210	.000255	.000750	.000155	
28, 100	28, 100	....	....	....	....	Tensile strength.

Fractured 2″.9 from neck. Appearance, granular.

No. 1040.

Marks, $^{12}\mathrm{M\,R_{13}\,T\,R_{2}}$ $\mathrm{B\,T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4.000	4,000	.00014	.00004	....	....	
5.000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00072	.00008	.00004	.00002	
16,000	16,000	.00076	.00004	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00096	.00008	....	....	
20,000	20,000	.00102	.00006	.00008	.00004	
21.000	21,000	.00108	.00006	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00136	.00006	.00018	.00010	
26,000	26,000	.00144	.00008	....	....	
27,000	27.000	.00152	.00008	....	....	
28,000	28,000	.00160	.00008	....	....	
29.000	29,000	.00170	.00010	....	....	
30,000	30,000	.00184	.00014	.00040	.00022	
31,000	31,000	.00196	.00012	....	....	
32,000	32,000	.00208	.00012	....	....	
33,000	33,000	.00222	.00014	....	....	
34,000	34,000	.00242	.00020	....	....	
35,000	35,000	.00270	.00028	.00096	.00056	
36,000	36,000	.00290	.00020	....	....	
37,000	37,000	.00312	.00022	....	....	
38,000	38,000	.00348	.00036	....	....	
39,000	39,000	.00386	.00038	....	....	
40,000	40,000	.00428	.00042	.00230	.00134	
41,000	41,000	.00470	.00042	....	....	
42,000	42,000	.00508	.00038	....	....	
43.000	43,000	.00558	.00050	....	....	
44,000	44,000	.00616	.00058	....	....	
45,000	45,000	.00654	.00038	.00426	.00196	
46,000	46,000	.00708	.00054	....	....	
47.000	47,000	.00752	.00044	....	....	
48,000	48,000	.00810	.00058	....	....	
49,000	49,000	.00850	.00040	....	....	
50,000	50,000	.00932	.00082	.00670	.00244	
65,480	65,480	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1041.

Marks, $^{12\,M\,R_{11}\,T\,R_{3}}_{B\,R_{28}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00004	.00002	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00008	.00004	
16,000	16,000	.00078	.00006	....	....	
17,000	17,000	.00084	.00006	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00102	.00006	.00014	.00006	
21,000	21,000	.00108	.00006	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00138	.00008	.00028	.00014	
26,000	26,000	.00146	.00008	....	....	
27,000	27,000	.00152	.00006	....	....	
28,000	28,000	.00162	.00010	....	....	
29,000	29,000	.00172	.00010	....	....	
30,000	30,000	.00188	.00016	.00050	.00022	
31,000	31,000	.00204	.00016	....	....	
32,000	32,000	.00216	.00012	....	....	
33,000	33,000	.00232	.00016	....	....	
34,000	34,000	.00252	.00020	....	....	
35,000	35,000	.00282	.00030	.00116	.00066	
36,000	36,000	.00308	.00026	....	....	
37,000	37,000	.00334	.00026	....	....	
38,000	38,000	.00368	.00034	....	....	
39,000	39,000	.00412	.00044	....	....	
40,000	40,000	.00468	.00056	.00272	.00156	
41,000	41,000	.00512	.00044	....	....	
42,000	42,000	.00550	.00038	....	....	
43,000	43,000	.00604	.00054	....	....	
44,000	44,000	.00636	.00032	....	....	
45,000	45,000	.00694	.00058	.00472	.00200	
46,000	46,000	.00746	.00052	....	....	
47,000	47,000	.00784	.00038	....	....	
48,000	48,000	.00848	.00064	....	....	
49,000	49,000	.00908	.00060	....	....	
50,000	50,000	.00962	.00054	.00710	.00238	
64,460	64,460	....	....	....	....	Ultimate strength.

Failed by triple flexure

BODY No. 14.

No. 4593.

Marks, $12\,M\,\underset{B\,T_1}{R_{14}}\,T\,R_2$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000105	.000055	....	....	
4,000	4,000	.000165	.000060	....	....	
5,000	5,000	.000230	.000065	0.	....	
6,000	6,000	.000290	.000060	....	....	
7,000	7,000	.000345	.000055	....	....	
8,000	8,000	.000405	.000060	....	....	
9,000	9,000	.000460	.000055	....	....	
10,000	10,000	.000525	.000065	.000025	.000025	
11,000	11,000	.000595	.000070	....	....	
12,000	12,000	.000665	.000070	.000045	.000020	
13,000	13,000	.000740	.000075	....	....	
14,000	14,000	.000825	.000085	.000075	.000030	
15,000	15,000	.000900	.000075	....	....	
16,000	16,000	.000990	.000090	.000105	.000035	
17,000	17,000	.001085	.000095	....	....	
18,000	18,000	.001200	.000115	.000185	.000080	
19,000	19,000	.001325	.000125	....	....	
20,000	20,000	.001450	.000125	.000300	.000115	
21,000	21,000	.001610	.000160	....	....	
22,000	22,000	.001800	.000190	.000500	.000200	
23,000	23,000	.002125	.000325	....	....	
24,000	24,000	.002350	.000225	.000850	.000350	
28,160	28,160	....	....	....	....	Tensile strength.

Fractured at middle of stem. Appearance, uniform, granular.

No. 4599.

Marks, $\mathrm{12\,M\,\underset{M\,T_1}{R_{14}}\,T\,R_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000150	.000045	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000260	.000060	....	....	
7,000	7,000	.000325	.000065	....	....	
8,000	8,000	.000385	.000060	....	....	
9,000	9,000	.000440	.000055	....	....	
10,000	10,000	.000495	.000055	.000040	.000040	
11,000	11,000	.000555	.000060	....	....	
12,000	12,000	.000610	.000055	.000050	.000010	
13,000	13,000	.000670	.000060	....	....	
14,000	14,000	000740	.000070	.000080	.000030	
15,000	15,000	.000810	.000070	....	....	
16,000	16,000	.000885	.000075	.000100	.000020	
17,000	17,000	.000965	.000080	....	....	
18,000	18,000	.001060	.000095	.000160	.000060	
19,000	19,000	.001150	.000090	....	....	
20,000	20,000	.001275	.000125	.000250	.000090	
21,000	21,000	.001400	.000125	....	....	
22,000	22,000	001550	.000150	.000375	.000125	
23,000	23,000	.001740	.000190	....	....	
24,000	24,000	.001915	.000175	.000610	.000235	
25,000	25,000	.002240	.000325	.000850	.000240	
25,020	25,020	....	....	....	....	Tensile strength.

Fractured at middle of stem. Appearance, granular.

No. 1007.

Marks, $\genfrac{}{}{0pt}{}{12\ M\ R_{14}\ T\ R_2}{B\ T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00008	.00008	....	....	
3,000	3,000	.00014	.00006	....	....	
4,000	4,000	.00020	.00006	....	....	
5,000	5,000	.00026	.00006	.00002	.00002	
6,000	6,000	.00034	.00008	....	....	
7,000	7,000	.00038	.00004	....	....	
8,000	8,000	.00042	.00004	....	....	
9,000	9,000	.00050	.00008	....	....	
10,000	10,000	.00054	.00004	.00008	.00006	
11,000	11,000	.00060	.00006	....	....	
12,000	12,000	.00068	.00008	....	....	
13,000	13,000	.00072	.00004	....	....	
14,000	14,000	.00080	.00008	....	....	
15,000	15,000	.00086	.00006	.00014	.00006	
16,000	16,000	.00092	.00006	....	....	
17,000	17,000	.00098	.00006	....	....	
18,000	18,000	.00106	.00008	....	....	
19,000	19,000	.00114	.00008	....	....	
20,000	20,000	.00120	.00006	.00020	.00006	
21,000	21,000	.00128	.00008	....	....	
22,000	22,000	.00134	.00006	....	....	
23,000	23,000	.00140	.00006	....	....	
24,000	24,000	.00152	.00012	....	....	
25,000	25,000	.00158	.00006	.00034	.00014	
26,000	26,000	.00172	.00014	....	....	
27,000	27,000	.00182	.00010	....	....	
28,000	28,000	.00190	.00008	....	....	
29,000	29,000	.00204	.00014	....	....	
30,000	30,000	.00218	.00014	.00072	.00038	
31,000	31,000	.00234	.00016	....	....	
32,000	32,000	.00248	.00014	....	....	
33,000	33,000	.00266	.00018	....	....	
34,000	34,000	.00282	.00016	....	....	
35,000	35,000	.00314	.00032	.00142	.00070	
36,000	36,000	.00354	.00040	....	....	
37,000	37,000	.00390	.00036	....	....	
38,000	38,000	.00420	.00030	....	....	
39,000	39,000	.00472	.00052	....	....	
40,000	40,000	.00502	.00030	.00292	.00150	
41,000	41,000	.00570	.00068	....	....	
42,000	42,000	.00604	.00034	....	....	
43,000	43,000	.00652	.00048	....	....	
44,000	44,000	.00700	.00048	....	....	
45,000	45,000	.00770	.00070	.00530	.00238	
46,000	46,000	.00848	.00078	....	....	
47,000	47,000	.00886	.00038	....	....	
48,000	48,000	.00930	.00044	....	....	
49,000	49,000	.01030	.00100	....	....	
50,000	50,000	.01120	.00090	.00840	.00310	
60,300	60,300	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1008.

Marks, $^{12\,M\,R_{14}\,T\,R_{8}}_{B\,R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00022	.00006	0.	....	
6,000	6,000	.00028	.00006	....	....	
7,000	7,000	.00034	.00006	....	....	
8,000	8,000	.00038	.00004	....	....	
9,000	9,000	.00042	.00004	....	....	
10,000	10,000	.00050	.00008	.00006	.00006	
11,000	11,000	.00054	.00004	....	....	
12,000	12,000	.00058	.00004	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00012	.00006	
16,000	16,000	.00084	.00008	....	....	
17,000	17,000	.00090	.00006	....	....	
18,000	18,000	.00096	.00006	....	....	
19,000	19,000	.00102	.00006	....	....	
20,000	20,000	.00110	.00008	.00014	.00002	
21,000	21,000	.00114	.00004	....	....	
22,000	22,000	.00122	.00008	....	....	
23,000	23,000	.00132	.00010	....	....	
24,000	24,000	.00138	.00006	....	....	
25,000	25,000	.00148	.00010	.00028	.00014	
26,000	26,000	.00158	.00010	....	....	
27,000	27,000	.00166	.00008	....	....	
28,000	28,000	.00178	.00012	....	....	
29,000	29,000	.00192	.00014	....	....	
30,000	30,000	.00204	.00012	.00062	.00034	
31,000	31,000	.00224	.00020	....	....	
32,000	32,000	.00238	.00014	....	....	
33,000	33,000	.00258	.00020	....	....	
34,000	34,000	.00284	.00026	....	....	
35,000	35,000	.00326	.00042	.00150	.00088.	
36,000	36,000	.00360	.00034	....	....	
37,000	37,000	.00382	.00022	....	....	
38,000	38,000	.00418	.00036	....	....	
39,000	39,000	.00466	.00048	....	....	
40,000	40,000	.00544	.00078	.00356	.00206	
41,000	41,000	.00594	.00050	....	....	
42,000	42,000	.00634	.00040	....	....	
43,000	43,000	.00690	.00056	....	....	
44,000	44,000	.00760	.00070	....	....	
45,000	45,000	.00814	.00054	.00578	.00228	
46,000	46,000	.00880	.00066	....	....	
47,000	47,000	.00950	.00070	....	....	
48,000	48,000	.01036	.00086	....	....	
49,000	49,000	.01138	.00102	....	....	
50,000	50,000	.01260	.00122	.00990	.00412	
59,100	59,100	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1009.

Marks, $\overset{12\,M\,R_{14}\,T\,R_{4}}{M\,T_{3}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00026	.00008	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00004	.00002	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00074	.00004	.00008	.00004	
16,000	16,000	.00082	.00008	....	....	
17,000	17,000	.00088	.00006	....	....	
18,000	18,000	.00094	.00006	....	....	
19,000	19,000	.00102	.00008	....	....	
20,000	20,000	.00110	.00008	.00014	.00006	
21,000	21,000	.00120	.00010	....	....	
22,000	22,000	.00126	.00006	....	....	
23,000	23,000	.00132	.00006	....	....	
24,000	24,000	.00140	.00008	....	....	
25,000	25,000	.00152	.00012	.00030	.00016	
26,000	26,000	.00164	.00012	....	....	
27,000	27,000	.00172	.00008	....	....	
28,000	28,000	.00184	.00012	....	....	
29,000	29,000	.00196	.00012	....	....	
30,000	30,000	.00214	.00018	.00064	.00034	
31,000	31,000	.00232	.00018	....	....	
32,000	32,000	.00250	.00018	....	....	
33,000	33,000	.00276	.00026	....	....	
34,000	34,000	.00304	.00028	....	....	
35,000	35,000	.00334	.00030	.00156	.00092	
36,000	36,000	.00376	.00042	....	....	
37,000	37,000	.00414	.00038	....	....	
38,000	38,000	.00444	.00030	....	....	
39,000	39,000	.00480	.00036	....	....	
40,000	40,000	.00544	.00064	.00350	.00194	
41,000	41,000	.00592	.00048	....	....	
42,000	42,000	.00646	.00054	....	....	
43,000	43,000	.00692	.00046	....	....	
44,000	44,000	.00744	.00052	....	....	
45,000	45,000	.00786	.00042	.00556	.00206	
46,000	46,000	.00876	.00090	....	....	
47,000	47,000	.00906	.00030	....	....	
48,000	48,000	.00930	.00024	....	....	
49,000	49,000	.00960	.00030	....	....	
50,000	50,000	.00984	.00024	.00734	.00178	
57,500	57,500	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 14 (second casting).

No. 4666.

Marks, $^{12\,\mathrm{M\,R_{14}\,T\,R_2}}_{\mathrm{B\,T_{11}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000260	.000060	....	....	
7,000	7,000	.000315	.000055	....	....	
8,000	8,000	.000365	.000050	....	....	
9,000	9,000	.000425	.000060	....	....	
10,000	10,000	.000495	.000070	.000025	.000025	
11,000	11,000	.000550	.000055	....	....	
12,000	12,000	.000610	.000060	.000035	.000010	
13,000	13,000	.000680	.000070	....	....	
14,000	14,000	.000750	.000070	.000055	000020	
15,000	15,000	.000830	.000080	....	....	
16,000	16,000	.000910	.000080	.000100	.000045	
17,000	17,000	.001000	.000090	....	....	
18,000	18,000	.001100	.000100	.000160	.000060	
19,000	19,000	.001210	.000110	....	....	
20,000	20,000	.001325	.000115	.000255	.000095	
21,000	21,000	.001490	.000165	....	....	
22,000	22,000	.001650	.000160	.000445	.000190	
23,000	23,000	.001850	.000200	....	....	
24,000	24,000	.002050	.000200	.000695	.000250	
25,000	25,000	.002350	.000300	.000900	.000205	
26,120	26,120	....	....	....	....	Tensile strength.

Fractured 5″.5 from neck. Appearance, granular.

No. 4667.

Marks, $\begin{matrix}^{12}\mathrm{M\,R_{14}\,T\,R_{1}}\\ \mathrm{M\,T_{11}}\end{matrix}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000355	.000055	....	....	
9,000	9,000	.000405	.000050	....	....	
10,000	10,000	.000460	.000055	.000025	.000025	
11,000	11,000	.000520	.000060	....	....	
12,000	12,000	.000590	.000070	.000045	.000020	
13,000	13,000	.000650	.000060	....	....	
14,000	14,000	.000705	.000055	.000050	.000005	
15,000	15,000	.000775	.000070	....	....	
16,000	16,000	.000850	.000075	.000085	.000035	
17,000	17,000	.000910	.000060	....	....	
18,000	18,000	.001000	.000090	.000125	.000040	
19,000	19,000	.001090	.000090	....	....	
20,000	20,000	.001190	.000100	.000195	.000070	
21,000	21,000	.001295	.000105	....	....	
22,000	22,000	.001410	.000115	.000300	.000105	
23,000	23,000	.001560	.000150	....	....	
24,000	24,000	.001720	.000160	.000455	.000155	
25,000	25,000	.001900	.000180	.000599	.000140	
29,100	29,100	....	....	....	....	Tensile strength.

Fractured 10″ from neck. Appearance, granular.

No. 1034.

Marks, $\genfrac{}{}{0pt}{}{12\ \mathrm{M\ R_{14}\ T\ R_2}}{\mathrm{B\ T_{12}}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00028	.00004			
8,000	8,000	.00032	.00004			
9,000	9,000	.00038	.00006			
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006			
12,000	12,000	.00054	.00004			
13,000	13,000	.00060	.00006			
14,000	14,000	.00064	.00004			
15,000	15,000	.00070	.00006	.00006	.00004	
16,000	16,000	.00076	.00006			
17,000	17,000	.00082	.00006			
18,000	18,000	.00086	.00004			
19,000	19,000	.00092	.00006			
20,000	20,000	.00098	.00006	.00010	.00004	
21,000	21,000	.00106	.00008			
22,000	22,000	.00112	.00006			
23,000	23,000	.00120	.00008			
24,000	24,000	.00128	.00008			
25,000	25,000	.00140	.00012	.00022	.00012	
26,000	26,000	.00146	.00006			
27,000	27,000	.00152	.00006			
28,000	28,000	.00162	.00010			
29,000	29,000	.00174	.00012			
30,000	30,000	.00188	.00014	.00046	.00024	
31,000	31,000	.00204	.00016			
32,000	32,000	.00220	.00016			
33,000	33,000	.00244	.00024			
34,000	34,000	.00270	.00026			
35,000	35,000	.00292	.00022	.00124	.00078	
36,000	36,000	.00326	.00034			
37,000	37,000	.00356	.00030			
38,000	38,000	.00398	.00042			
39,000	39,000	.00430	.00032			
40,000	40,000	.00478	.00048	.00284	.00160	
41,000	41,000	.00544	.00066			
42,000	42,000	.00580	.00036			
43,000	43,000	.00624	.00044			
44,000	44,000	.00682	.00058			
45,000	45,000	.00734	.00052	.00508	.00224	
46,000	46,000	.00782	.00048			
47,000	47,000	.00826	.00044			
48,000	48,000	.00858	.00032			
49,000	49,000	.00918	.00060			
50,000	50,000	.00972	.00054	.00720	.00212	
60,900	60,900					Ultimate strength.

Failed by triple flexure.

No. 1035.

Marks, $12\ M\ R_{14}\ T\ R_{8}\ B\ R_{20}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00032	.00006	....	....	
9,000	9,000	.00036	.00004	....	....	
10,000	10,000	.00042	.00006	0.	....	
11,000	11,000	.00046	.00004	....	....	
12,000	12,000	.00052	.00006	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00068	.00004	.00004	.00004	
16,000	16,000	.00074	.00006	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00098	.00006	.00010	.00006	
21,000	21,000	.00106	.00008	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00118	.00006	....	....	
24,000	24,000	.00124	.00006	....	....	
25,000	25,000	.00132	.00008	.00020	.00010	
26,000	26,000	.00142	.00010	....	....	
27,000	27,000	.00150	.00008	....	....	
28,000	28,000	.00160	.00010	....	....	
29,000	29,000	.00172	.00012	....	....	
30,000	30,000	.00186	.00014	.00068	.00048	
31,000	31,000	.00208	.00022	....	....	
32,000	32,000	.00224	.00016	....	....	
33,000	33,000	.00242	.00018	....	....	
34,000	34,000	.00268	.00026	....	....	
35,000	35,000	.00300	.00032	.00134	.00066	
36,000	36,000	.00342	.00042	....	....	
37,000	37,000	.00378	.00036	....	....	
38,000	38,000	.00418	.00040	....	....	
39,000	39,000	.00458	.00040	....	....	
40,000	40,000	.00520	.00062	.00326	.00192	
41,000	41,000	.00562	.00042	....	....	
42,000	42,000	.00620	.00058	....	....	
43,000	43,000	.00654	.00034	....	....	
44,000	44,000	.00710	.00056	....	....	
45,000	45,000	.00814	.00104	.00584	.00258	
46,000	46,000	.00848	.00034	....	....	
47,000	47,000	.00888	.00040	....	....	
48,000	48,000	.00952	.00064	....	....	
49,000	49,000	.01028	.00076	....	....	
50,000	50,000	.01108	.00080	.00848	.00264	
61,780	61,780	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1036.

Marks, $^{12}\,\mathrm{M}\,\underset{\mathrm{M}\ \mathrm{T}_{12}}{\mathrm{R}_{14}}\ \mathrm{T}\ \mathrm{R}_{1}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00036	.00004	....	....	
10,000	10,000	.00042	.00006	.00002	.00002	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00062	.00004	....	....	
15,000	15,000	.00068	.00006	.00004	.00002	
16,000	16,000	.00074	.00006	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00096	.00004	.00008	.00004	
21,000	21,000	.00104	.00008	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00118	.00008	....	....	
24,000	24,000	.00124	.00006	....	....	
25,000	25,000	.00132	.00008	.00018	.00010	
26,000	26,000	.00140	.00008	....	....	
27,000	27,000	.00150	.00010	....	....	
28,000	28,000	.00158	.00008	....	....	
29,000	29.000	.00168	.00010	....	....	
30,000	30,000	.00184	.00016	.00046	.00028	
31,000	31,000	.00202	.00018	....	....	
32,000	32,000	.00220	.00018	....	....	
33,000	33,000	.00236	.00016	....	....	
34,000	34,000	.00258	.00022	....	....	
35,000	35,000	.00284	.00026	.00118	.00072	
36,000	36,000	.00320	.00036	....	....	
37,000	37,000	.00360	.00040	....	....	
38,000	38,000	.00392	.00032	....	....	
39,000	39,000	.00440	.00048	....	....	
40,000	40,000	.00516	.00076	.00322	.00204	
41,000	41,009	.00562	.00046	....	....	
42,000	42,000	.00602	.00040	....	....	
43,000	43,000	.00664	.00062	....	....	
44,000	44,000	.00728	.00064	....	....	
45,000	45,000	.00790	.00062	.00566	.00244	
46,000	46,000	.00840	.00050	....	....	
47,000	47,000	.00880	.00040	....	....	
48,000	48,000	.00936	.00056	....	....	
49,000	49,000	.01016	.00080	....	....	
50,000	50,000	.01092	.00076	.00836	.00270	Ultimate strength.
59,600	59,600	....	....	....	....	

Failed by triple flexure.

Body No. 15.

No. 4604.

Marks, $\begin{smallmatrix}12\,M\,R_{11}\,T\,R_{3}\\ B\,T_{1}\end{smallmatrix}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000160	.000055	....	....	
5,000	5,000	.000215	.000055	0.	....	
6,000	6,000	.000280	.000065	....	....	
7,000	7,000	.000340	.000060	....	....	
8,000	8,000	.000405	.000065	....	....	
9,000	9,000	.000475	.000070	....	....	
10,000	10,000	.000540	.000065	.000040	.000040	
11,000	11,000	.000615	.000075	....	....	
12,000	12,000	.000700	.000085	.000065	.000025	
13,000	13,000	.000780	.000080	....	....	
14,000	14,000	.000850	.009070	.000105	.000040	
15,000	15,000	.000950	.000100	....	....	
16,000	16,000	.001045	.000095	.000160	.000055	
17,000	17,000	.001155	.000110	....	....	
18,000	18,000	.001290	.000135	.000250	.000090	
19,000	19,000	.001435	.000145	....	....	
20,000	20,000	.001600	.000165	.000415	.000165	
21,000	21,000	.001775	.000175	....	....	
22,000	22,000	.002000	.000225	.000665	.000250	
23,000	23,000	.002300	.000300	....	....	
24,000	24,000	.002650	.000350	.001150	.000485	
25,690	25,600	....	....	....	....	Tensile strength.

Fractured 3½″ from neck. Appearance, granular, with coarse stellar arrangement.

No. 4605.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{15}\,\mathrm{T}\,\mathrm{R}_1}_{\mathrm{M}\,\mathrm{T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000155	.000050	....	....	
5,000	5,000	.000210	.000055	0.	....	
6,000	6,000	.000260	.000050	....	....	
7,000	7,000	.000315	.000055	....	....	
8,000	8,000	.000375	.000060	....	....	
9,000	9,000	.000440	.000065	....	....	
10,000	10,000	.000505	.000065	.000025	.000025	
11,000	11,000	.000565	.000060	....	....	
12,000	12,000	.000630	.000065	.000045	.000020	
13,000	13,000	.000695	.000065	....	....	
14,000	14,000	.000760	.000065	.000055	.000010	
15,000	15,000	.000840	.000080	....	....	
16,000	16,000	.000915	.000075	.000095	.000040	
17,000	17,000	.001000	.000085	....	....	
18,000	18,000	.001100	.000100	.000155	.000060	
19,000	19,000	.001200	.000100	....	....	
20,000	20,000	.001320	.000120	.000240	.000085	
21,000	21,000	.001490	.000170	....	....	
22,000	22,000	.001655	.000165	.000420	.000180	
23,000	23,000	.001825	.000170	....	....	
24,000	24,000	.002100	.000275	.000705	.000285	
25,000	25,000	.002400	.000300	....	....	Tensile strength.

Fractured 9½″ from neck. Appearance, uniform, granular.

No. 1013.

Marks, $\begin{smallmatrix}12\ M\ R_4\ T\ R_2\\ B\ T_2\end{smallmatrix}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00024	.00008	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00044	.00006	.00004	.00004	
11,000	11,000	.00052	.00008	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00066	.00008	....	....	
14,000	14,000	.00070	.00004	....	....	
15,000	15,000	.00078	.00008	.00008	.00004	
16,000	16,000	.00084	.00006	....	....	
17,000	17,000	.00090	.00006	....	....	
18,000	18,000	.00096	.00006	....	....	
19,000	19,000	.00104	.00008	....	....	
20,000	20,000	.00112	.00008	.00014	.00006	
21,000	21,000	.00118	.00006	....	....	
22,000	22,000	.00128	.00010	....	....	
23,000	23,000	.00138	.00010	....	....	
24,000	24,000	.00148	.00010	....	....	
25,000	25,000	.00158	.00010	.00028	.00014	
26,000	26,000	.00170	.00012	....	....	
27,000	27,000	.00182	.00012	....	....	
28,000	28,000	.00192	.00010	....	....	
29,000	29,000	.00204	.00012	....	....	
30,000	30,000	.00224	.00020	.00064	.00036	
31,000	31,000	.00240	.00016	....	....	
32,000	32,000	.00264	.00024	....	....	
33,000	33,000	.00284	.00020	....	....	
34,000	34,000	.00310	.00026	....	....	
35,000	35,000	.00344	.00034	.00160	.00096	
36,000	36,000	.00376	.00032	....	....	
37,000	37,000	.00424	.00048	....	....	
38,000	38,000	.00466	.00042	....	....	
39,000	39,000	.00500	.00036	....	....	
40,000	40,000	.00550	.00050	.00340	.00180	
41,000	41,000	.00600	.00050	....	....	
42,000	42,000	.00644	.00044	....	....	
43,000	43,000	.00672	.00038	....	....	
44,000	44,000	.00760	.00088	....	....	
45,000	45,000	.00792	.00032	.00550	.00210	
46,000	46,000	.00840	.00048	....	....	
47,000	47,000	.00868	.00028	....	....	
48,000	48,000	.00896	.00028	....	....	
49,000	49,000	.00910	.00014	....	....	
50,000	50,000	.00930	.00020	.00684	.00134	
56,550	56,550	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1014.

Marks, $\begin{smallmatrix}12\,M\,R_{15}\,T\,R_{2}\\ B\,R_{10}\end{smallmatrix}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00048	.00008	.00004	.00004	
11,000	11,000	.00054	.00006	....	....	
12,000	12,000	.00058	.00004	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00068	.00004	....	....	
15,000	15,000	.00074	.00006	.00008	.00004	
16,000	16,000	.00080	.00006	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00094	.00008	....	....	
19,000	19,000	.00102	.00008	....	....	
20,000	20,000	.00108	.00006	.00012	.00004	
21,000	21,000	.00114	.00006	....	....	
22,000	22,000	.00124	.00010	....	....	
23,000	23,000	.00130	.00006	....	....	
24,000	24,000	.00140	.00010	....	....	
25,000	25,000	.00152	.00012	.00026	.00014	
26,000	26,000	.00160	.00008	....	....	
27,000	27,000	.00174	.00014	....	....	
28,000	28,000	.00182	.00008	....	....	
29,000	29,000	.00194	.00012	....	....	
30,000	30,000	.00212	.00018	.00060	.00032	
31,000	31,000	.00228	.00016	....	....	
32,000	32,000	.00252	.00024	....	....	
33,000	33,000	.00284	.00032	....	....	
34,000	34,000	.00310	.00026	....	....	
35,000	35,000	.00336	.00026	.00164	.00104	
36,000	36,000	.00376	.00040	....	....	
37,000	37,000	.00420	.00044	....	....	
38,000	38,000	.00460	.00040	....	....	
39,000	39,000	.00510	.00050	....	....	
40,000	40,000	.00576	.00066	.00370	.00206	
41,000	41,000	.00630	.00054	....	....	
42,000	42,000	.00684	.00054	....	....	
43,000	43,000	.00724	.00040	....	....	
44,000	44,000	.00814	.00090	....	....	
45,000	45,000	.00900	.00086	.00670	.00300	
46,000	46,000	.00960	.00060	....	....	
47,000	47,000	.01040	.00080	....	....	
48,000	48,000	.01120	.00080	....	....	
49,000	49,000	.01230	.00110	....	....	
50,000	50,000	.01400	.00170	.01120	.00450	
57,580	57,580	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1015.

Marks, $^{12\,M\,R_{18}\,T\,R_1}_{M\,T_2}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00022	.00006	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00046	.00008	.00004	.00004	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00006	.00002	
16,000	16,000	.00078	.00006	....	....	
17,000	17,000	.00086	.00008	....	....	
18,000	18,000	.00092	.00006	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00104	.00006	.00010	.00014	
21,000	21,000	.00112	.00008	....	....	
22,000	22,000	.00116	.00004	....	....	
23,000	23,000	.00124	.00008	....	....	
24,000	24,000	.00132	.00008	....	....	
25,000	25,000	.00144	.00012	.00022	.00012	
26,000	26,000	.00154	.00010	....	....	
27,000	27,000	.00162	.00008	....	....	
28,000	28,000	.00172	.00010	....	....	
29,000	29,000	.00184	.00012	....	....	
30,000	30,000	.00196	.00012	.00018	.00026	
31,000	31,000	.00214	.00018	....	....	
32,000	32,000	.00232	.00018	....	....	
33,000	33,000	.00254	.00022	....	....	
34,000	34,000	.00278	.00024	....	....	
35,000	35,000	.00300	.00022	.00124	.00076	
36,000	36,000	.00344	.00044	....	....	
37,000	37,000	.00380	.00036	....	....	
38,000	38,000	.00430	.00050	....	....	
39,000	39,000	.00472	.00042	....	....	
40,000	40,000	.00514	.00042	.00320	.00196	
41,000	41,000	.00568	.00054	....	....	
42,000	42,000	.00630	.00062	....	....	
43,000	43,000	.00678	.00048	....	....	
44,000	44,000	.00750	.00072	....	....	
45,000	45,000	.00824	.00074	.00590	.00270	
46,000	46,000	.00884	.00060	....	....	
47,000	47,000	.00954	.00070	....	....	
48,000	48,000	.01024	.00070	....	....	
49,000	49,000	.01120	.00104	....	....	
50,000	50,000	.01202	.00082	.00944	.00354	
55,680	55,680	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 15 (second casting).

No. 4668.

Marks, ^{12}M R$_{15}$ T R$_1$ B T$_{11}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000155	.000055	....	....	
5,000	5,000	.000205	.600050	.000010	.000010	
6,000	6,000	.000260	.000055	....	....	
7,000	7,000	.000320	.000060	....	....	
8,000	8,000	.000390	.000070	....	....	
9,000	9,000	.000445	.000055	....	....	
10,000	10,000	.600500	.000055	.000040	.000030	
11,000	11,000	.000560	.000060	....	....	
12,000	12,000	.000630	.000070	.000050	.000010	
13,000	13,000	.000700	.000070	....	....	
14,000	14,000	.000770	.000070	.000090	.000040	
15,000	15,000	.000850	.000080	....	....	
16,000	16,000	.000925	.000075	.000110	.000020	
17,000	17,000	.001010	.000085	....	....	
18,000	18,000	.001110	.000100	.000190	.000080	
19,000	19,000	.001215	.000105	....	....	
20,000	20,000	.001340	.000125	.900290	.000100	
21,000	21,000	.001485	.000145	....	....	
22,000	22,000	.001625	.000140	.000450	.000160	
23,000	23,000	.001825	.000200	....	....	
24,000	24,000	.002040	.000215	.000700	.000250	
25,000	25,000	.002350	.000310	.000900	.000200	
27,120	27,120	....	....	....	....	Tensile strength.

Fractured 3″.6 from neck. Appearance, granular.

No. 4669.

Marks, $\mathrm{^{12\,M\,R_{15}\,T\,R_1}_{M\,T_{11}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000400	.000050	....	....	
10,000	10,000	.000450	.000050	.000015	.000015	
11,000	11,000	.000510	.000060	....	....	
12,000	12,000	.000560	.000050	.000040	.000025	
13,000	13,000	.000635	.000075	....	....	
14,000	14,000	.000700	.000065	.000050	.000010	
15,000	15,000	.000755	.000055	....	....	
16,000	16,000	.000820	.000065	.000090	.000040	
17,000	17,000	.000900	.000080	....	....	
18,000	18,000	.000980	.000080	.000115	.000025	
19,000	19,000	.001060	.000080	....	....	
20,000	20,000	.001145	.000085	.000180	.000065	
21,000	21,000	.001255	.000110	....	....	
22,000	22,000	.001360	.000105	.000265	.000085	
23,000	23,000	.001500	.000140	....	....	
24,000	24,000	.001650	.000150	.000420	.000155	
25,000	25,000	.001825	.000175	.000550	.000130	
29,050	29,050	....	....	....	....	Tensile strength.

Fractured 2″.1 from neck. Appearance, granular.

No. 1037.

Marks, $\substack{12\ M\ R_{15}\ T\ R_2 \\ B\ T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00004	.00004	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00056	.00004	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00006	.00002	
16,000	16,000	.00076	.00004	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00102	.00008	.00010	.00004	
21,000	21,000	.00108	.00006	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00136	.00006	.00022	.00012	
26,000	26,000	.00144	.00008	....	....	
27,000	27,000	.00154	.00010	....	....	
28,000	28,000	.00166	.00012	....	....	
29,000	29,000	.00176	.00010	....	....	
30,000	30,000	.00190	.00014	.00050	.00028	
31,000	31,000	.00210	.00020	....	....	
32,000	32,000	.00226	.00016	....	....	
33,000	33,000	.00244	.00018	....	....	
34,000	34,000	.00272	.00028	....	....	
35,000	35,000	.00302	.00030	.00134	.00084	
36,000	36,000	.00340	.00038	....	....	
37,000	37,000	.00370	.00030	....	....	
38,000	38,000	.00412	.00042	....	....	
39,000	39,000	.00456	.00044	....	....	
40,000	40,000	.00504	.00048	.00306	.00172	
41,000	41,000	.00550	.00046	....	....	
42,000	42,000	.00590	.00040	....	....	
43,000	43,000	.00632	.00042	....	....	
44,000	44,000	.00682	.00050	....	....	
45,000	45,000	.00750	.00068	.00524	.00218	
46,000	46,000	.00806	.00056	....	....	
47,000	47,000	.00840	.00034	....	....	
48,000	48,000	.00888	.00048	....	....	
49,000	49,000	.00946	.00058	....	....	
50,000	50,000	.01002	.00056	.00748	.00224	
61,650	61,650	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1038.

Marks, $\begin{array}{c}12\ M\ R_{15}\ T\ R_2\\ B\ R_{20}\end{array}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00036	.00004	....	....	
10,000	10,000	.00042	.00006	.00002	.00002	
11,000	11,000	.00050	.00008	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00070	.00006	.00006	.00004	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00100	.00006	.00010	.00004	
21,000	21,000	.00108	.00008	....	....	
22,000	22,000	.00112	.00004	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00134	.00006	.00022	.00012	
26,000	26,000	.00144	.00010	....	....	
27,000	27,000	.00152	.00008	....	....	
28,000	28,000	.00164	.00012	....	....	
29,000	29,000	.00174	.00010	....	....	
30,000	30,000	.00196	.00022	.00060	.00038	
31,000	31,000	.00212	.00016	....	....	
32,000	32,000	.00230	.00018	....	....	
33,000	33,000	.00246	.00016	....	....	
34,000	34,000	.00264	.00018	....	....	
35,000	35,000	.00296	.00032	.00130	.00070	
36,000	36,000	.00324	.00028	....	....	
37,000	37,000	.00374	.00050	....	....	
38,000	38,000	.00412	.00038	....	....	
39,000	39,000	.00472	.00060	....	....	
40,000	40,000	.00520	.00048	.00326	.00196	
41,000	41,000	.00564	.00044	....	....	
42,000	42,000	.00612	.00048	....	....	
43,000	43,000	.00654	.00042	....	....	
44,000	44,000	.00712	.00058	....	....	
45,000	45,000	.00774	.00062	.00576	.00250	
46,000	46,000	.00832	.00058	....	....	
47,000	47,000	.00892	.00060	....	....	
48,000	48,000	.00946	.00054	....	....	
49,000	49,000	.01000	.00054	....	....	
50,000	50,000	.01060	.00060	.00802	.00226	
61,560	61,560	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1039.

Marks, $\underset{M\,T_{12}}{^{12}M\,R_{15}\,T\,R_1}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00048	.00004	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00070	.00004	.00004	.00002	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00100	.00006	.00010	.00006	
21,000	21,000	.00108	.00008	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00138	.00008	.00022	.00012	
26,000	26,000	.00148	.00010	....	....	
27,000	27,000	.00156	.00008	....	....	
28,000	28,000	.00168	.00012	....	....	
29,000	29,000	.00180	.00012	....	....	
30,000	30,000	.00196	.00016	.00054	.00032	
31,000	31,000	.00212	.00016	....	....	
32,000	32,000	.00234	.00022	....	....	
33,000	33,000	.00260	.00026	....	....	
34,000	34,000	.00286	.00026	....	....	
35,000	35,000	.00316	.00030	.00142	.00088	
36,000	36,000	.00348	.00032	....	....	
37,000	37,000	.00378	.00030	....	....	
38,000	38,000	.00422	.00044	....	....	
39,000	39,000	.00462	.00040	....	....	
40,000	40,000	.00508	.00046	.00310	.00168	
41,000	41,000	.00560	.00052	....	....	
42,000	42,000	.00600	.00040	....	....	
43,000	43,000	.00648	.00048	....	....	
44,000	44,000	.00720	.00072	....	....	
45,000	45,000	.00760	.00040	.00534	.00224	
46,000	46,000	.00804	.00044	....	....	
47,000	47,000	.00838	.00034	....	....	
48,000	48,000	.00868	.00030	....	....	
49,000	49,000	.00908	.00040	....	....	
50,000	50,000	.00928	.00020	.00692	.00158	
59,800	59,800	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 16.

No. 4606.

Marks, $\substack{12\,\mathrm{M\,R}_{16}\,\mathrm{T\,R}_{2} \\ \mathrm{B\,T}_{1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000105	.000055	....	....	
4,000	4,000	.000160	.000055	....	....	
5,000	5,000	.000220	.000060	0.	....	
6,000	6,000	.000285	.000065	....	....	
7,000	7,000	.000345	.000060	....	....	
8,000	8,000	.000400	.000055	....	....	
9,000	9,000	.000460	.000060	....	....	
10,000	10,000	.000530	.000070	.000045	.000045	
11,000	11,000	.000600	.000070	....	....	
12,000	12,000	.000670	.000070	.000060	.000015	
13,000	13,000	.000750	.000080	....	....	
14,000	14,000	.000825	.000075	.000100	.000040	
15,000	15,000	.000915	.000090	....	....	
16,000	16,000	.001005	.000090	.000150	.000050	
17,000	17,000	.001105	.000100	....	....	
18,000	18,000	.001215	.000110	.000225	.000075	
19,000	19,000	.001340	.000125	....	....	
20,000	20,000	.001475	.000135	.000355	.000130	
21,000	21,000	.001650	.000175	....	....	
22,000	22,000	.001850	.000200	.000575	.000220	
23,000	23,000	.002175	.000325	....	....	
23,380	23,380	....	....	....	....	Tensile strength.

Fractured $3\frac{3}{4}''$ from neck. Appearance, uniform, granular.

No. 4607.

Marks, $^{12\,\mathrm{M\,R_{14}\,T\,R_1}}_{\mathrm{M\,T_1}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000095	.000050	....	....	
4,000	4,000	.000145	.000050	....	....	
5,000	5,000	.000195	.000050	0.	....	
6,000	6,000	.000245	.000050	....	....	
7,000	7,000	.000300	.000055	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000405	.000055	....	....	
10,000	10,000	.000460	.000055	.000015	.000015	
11,000	11,000	.000525	.000065	....	....	
12,000	12,000	.000590	.000065	.000040	.000025	
13,000	13,000	.000645	.000055	....	....	
14,000	14,000	.000700	.000055	.000050	.000010	
15,000	15,000	.000775	.000075	....	....	
16,000	16,000	.000850	.000075	.000065	.000015	
17,000	17,000	.000920	.000070	....	....	
18,000	18,000	.000990	.000070	.000105	.000040	
19,000	19,000	.001070	.000080	....	....	
20,000	20,000	.001155	.000085	.000170	.000065	
21,000	21,000	.001250	.000095	....	....	
22,000	22,000	.001365	.000115	.000240	.000070	
23,000	23,000	.001490	.000125	....	....	
24,000	24,000	.001620	.000130	.000360	.000120	
25,000	25,000	.001800	.000180	.000460	.000100	
29,710	29,710	....	....	....	....	Tensile strength.

Fractured at the neck. Appearance, uniform, granular.

No. 1016.

Marks, $\underset{\mathrm{B\ T_7}}{\mathrm{12\ M\ R_{14}\ T\ R_2}}$,
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00004	.00002	
16,000	16,000	.00078	.00006	....	....	
17,000	17,000	.00084	.00006	....	....	
18,000	18,000	.00092	.00008	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00106	.00008	.00008	.00004	
21,000	21,000	.00114	.00008	....	....	
22,000	22,000	.00122	.00008	....	....	
23,000	23,000	.00128	.00006	....	....	
24,000	24,000	.00134	.00006	....	....	
25,000	25,000	.00144	.00010	.00024	.00016	
26,000	26,000	.00158	.00014	....	....	
27,000	27,000	.00168	.00010	....	....	
28,000	28,000	.00182	.00014	....	....	
29,000	29,000	.00194	.00012	....	....	
30,000	30,000	.00212	.00018	.00060	.00036	
31,000	31,000	.00238	.00026	....	....	
32,000	32,000	.00256	.00018	....	....	
33,000	33,000	.00280	.00024	....	....	
34,000	34,000	.00310	.00030	....	....	
35,000	35,000	.00348	.00038	.00160	.00100	
36,000	36,000	.00390	.00042	....	....	
37,000	37,000	.00430	.00040	....	....	
38,000	38,000	.00472	.00042	....	....	
39,000	39,000	.00520	.00048	....	....	
40,000	40,000	.00578	.00058	.00360	.00200	
41,000	41,000	.00630	.00052	....	....	
42,000	42,000	.00684	.00054	....	....	
43,000	43,000	.00734	.00050	....	....	
44,000	44,000	.00792	.00058	....	....	
45,000	45,000	.00870	.00078	.00630	.00270	
46,000	46,000	.00930	.00060	....	....	
47,000	47,000	.00980	.00050	....	....	
48,000	48,000	.01038	.00058	....	....	
49,000	49,000	.01124	.00086	....	....	
50,000	50,000	.01204	.00080	.00910	.00310	
57,700	57,700	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1017.

Marks, $\overset{12\ M\ R_{18}\ T\ R_2}{B\ R_{18}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00016	.00006			
5,000	5,000	.00020	.00004	.00002	.00002	
6,000	6,000	.00026	.00006			
7,000	7,000	.00032	.00006			
8,000	8,000	.00038	.00006			
9,000	9,000	.00042	.00004			
10,000	10,000	.00048	.00006	.00006	.00004	
11,000	11,000	.00054	.00006			
12,000	12,000	.00060	.00006			
13,000	13,000	.00066	.00006			
14,000	14,000	.00072	.00006			
15,000	15,000	.00078	.00006	.00010	.00004	
16,000	16,000	.00084	.00006			
17,000	17,000	.00090	.00006			
18,000	18,000	.00096	.00006			
19,000	19,000	.00102	.00006			
20,000	20,000	.00110	.00008	.00014	.00004	
21,000	21,000	.00118	.00008			
22,000	22,000	.00124	.00006			
23,000	23,000	.00132	.00008			
24,000	24,000	.00140	.00008			
25,000	25,000	.00148	.00008	.00026	.00012	
26,000	26,000	.00160	.00012			
27,000	27,000	.00170	.00010			
28,000	28,000	.00182	.00012			
29,000	29,000	.00194	.00012			
30,000	30,000	.00212	.00018	.00060	.00034	
31,000	31,000	.00232	.00020			
32,000	32,000	.00250	.00018			
33,000	33,000	.00274	.00024			
34,000	34,000	.00304	.00030			
35,000	35,000	.00340	.00036	.00164	.00104	
36,000	36,000	.00370	.00030			
37,000	37,000	.00416	.00046			
38,000	38,000	.00464	.00048			
39,000	39,000	.00514	.00050			
40,000	40,000	.00554	.00040	.00344	.00180	
41,000	41,000	.00600	.00046			
42,000	42,000	.00664	.00064			
43,000	43,000	.00710	.00046			
44,000	44,000	.00752	.00042			
45,000	45,000	.00824	.00072	.00580	.00236	
46,000	46,000	.00872	.00048			
47,000	47,000	.00916	.00044			
48,000	48,000	.00980	.00064			
49,000	49,000	.01012	.00032			
50,000	50,000	.01078	.00066	.00820	.00240	
59,380	59,380					Ultimate strength.

Failed by triple flexure.

No. 1018.

Marks, $\substack{12\,M\,R_{16}\,T\,R_{1}\\ M\,T_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9,000	.00036	.00006	....	....	
10,000	10,000	.00040	.00004	.00004	.00004	
11,000	11,000	.00046	.00006	....	....	
12,000	12,000	.00054	.00008	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00068	.00004	.00008	.00004	
16,000	16,000	.00078	.00010	....	....	
17,000	17,000	.00084	.00006	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00094	.00004	....	....	
20,000	20,000	.00100	.00006	.00012	.00004	
21,000	21,000	.00108	.00008	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00120	.00006	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00134	.00006	.00020	.00008	
26,000	26,000	.00146	.00012	....	....	
27,000	27,000	.00156	.00010	....	....	
28,000	28,000	.00164	.00008	....	....	
29,000	29,000	.00180	.00016	....	....	
30,000	30,000	.00194	.00014	.00050	.00030	
31,000	31,000	.00208	.00014	....	....	
32,000	32,000	.00226	.00018	....	....	
33,000	33,000	.00248	.00022	....	....	
34,000	34,000	.00268	.00020	....	....	
35,000	35,000	.00300	.00032	.00130	.00080	
36,000	36,000	.00322	.00022	....	....	
37,000	37,000	.00350	.00028	....	....	
38,000	38,000	.00400	.00050	....	....	
39,000	39,000	.00464	.00064	....	....	
40,000	40,000	.00518	.00054	.00320	.00190	
41,000	41,000	.00580	.00062	....	....	
42,000	42,000	.00620	.00040	....	....	
43,000	43,000	.00680	.00060	....	....	
44,000	44,000	.00744	.00064	....	....	
45,000	45,000	.00804	.00060	.00576	.00256	
46,000	46,000	.00900	.00096	....	....	
47,000	47,000	.00930	.00030	....	....	
48,000	48,000	.01038	.00108	....	....	
49,000	49,000	.01124	.00086	....	....	
50,000	50,000	.01248	.00124	.00970	.00394	
58,440	58,440	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 16 (second casting).

No. 4671.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{16}\,\mathrm{T}\,\mathrm{R}_{2}}_{\mathrm{B}\,\mathrm{T}_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000365	.000065	....	....	
9,000	9,000	.000425	.000060	....	....	
10,000	10,000	.000485	.000060	.000025	.000025	
11,000	11,000	.000545	.000060	....	....	
12,000	12,000	.000605	.000060	.000045	.000020	
13,000	13,000	.000680	.000075	....	....	
14,000	14,000	.000750	.000070	.000065	.000020	
15,000	15,000	.000835	.000085	....	....	
16,000	16,000	.000905	.000070	.000100	.000035	
17,000	17,000	.000990	.000085	....	....	
18,000	18,000	.001090	.000100	.000160	.000060	
19,000	19,000	.001190	.000100	....	....	
20,000	20,000	.001300	.000110	.000250	.000090	
21,000	21,000	.001440	.000140	....	....	
22,000	22,000	.001590	.000150	.000395	.000145	
23,000	23,000	.001755	.000165	....	....	
24,000	24,000	.001950	.000195	.000615	.000220	
25,000	25,000	.002250	.000300	.000810	.000195	
26,780	26,780	....	....	....	....	Tensile strength.

Fractured 7″.3 from neck. Appearance, granular.

No. 4672.

Marks, $^{12\,\mathrm{M\,R_{14}\,T\,R_1}}_{\mathrm{M\,T_{11}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000305	.000055	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000410	.000050	....	....	
10,000	10,000	.000465	.000055	.000020	.000020	
11,000	11,000	.000540	.000075	....	....	
12,000	12,000	.000600	.000060	.000040	.000020	
13,000	13,000	.000655	.000055	....	....	
14,000	14,000	.000725	.000070	.000060	.000020	
15,000	15,000	.000800	.000075	....	....	
16,000	16,000	.000860	.000060	.000095	.000035	
17,000	17,000	.000945	.000085	....	....	
18,000	18,000	.001030	.000085	.000140	.000045	
19,000	19,000	.001105	.000075	....	....	
20,000	20,000	.001200	.000095	.000200	.000060	
21,000	21,000	.001310	.000110	....	....	
22,000	22,000	.001425	.000115	.000305	.000105	
23,000	23,000	.001595	.000170	....	....	
24,000	24,000	.001750	.000155	.000500	.000195	
25,000	25,000	.001945	.000195	.000605	.000105	
27,040	27,040	....	....	....	....	Tensile strength.

Fractured at the neck. Appearance, granular.

No. 1042.

Marks, $^{12}\mathrm{M}\,\underset{\mathrm{B}}{\mathrm{R}_{18}}\,\underset{\mathrm{T}_{12}}{\mathrm{T}}\,\mathrm{R}_2$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00056	.00004	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00008	.00006	
16,000	16,000	.00078	.00006	....	....	
17,000	17,000	.00086	.00008	....	....	
18,000	18,000	.00090	.00004	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00102	.00006	.00012	.00004	
21,000	21,000	.00110	.00008	....	....	
22,000	22,000	.00114	.00004	....	....	
23,000	23,000	.00120	.00006	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00138	.00010	.00022	.00010	
26,000	26,000	.00144	.00006	....	....	
27,000	27,000	.00152	.00008	....	....	
28,000	28,000	.00162	.00010	....	....	
29,000	29,000	.00174	.00012	....	....	
30,000	30,000	.00188	.00014	.00050	.00028	
31,000	31,000	.00202	.00014	....	....	
32,000	32,000	.00218	.00016	....	....	
33,000	33,000	.00236	.00018	....	....	
34,000	34,000	.00260	.00024	....	....	
35,000	35,000	.00292	.00032	.00130	.00080	
36,000	36,000	.00322	.00030	....	....	
37,000	37,000	.00352	.00030	....	....	
38,000	38,000	.00392	.00040	....	....	
39,000	39,000	.00432	.00040	....	....	
40,000	40,000	.00490	.00058	.00298	.00168	
41,000	41,000	.00528	.00038	....	....	
42,000	42,000	.00574	.00046	....	....	
43,000	43,000	.00630	.00056	....	....	
44,000	44,000	.00686	.00056	....	....	
45,000	45,000	.00738	.00052	.00512	.00214	
46,000	46,000	.00786	.00048	....	....	
47,000	47,000	.00850	.00064	....	....	
48,000	48,000	.00900	.00050	....	....	
49,000	49,000	.00940	.00040	....	....	
50,000	50,000	.01022	.00082	.00770	.00258	
63,400	63,400	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1043.

Marks, $^{12\,M\,R_{16}\,T\,R_{2}}_{\quad B\,R_{20}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00070	.00004	.00008	.00006	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00080	.00004	....	....	
18,000	18,000	.00088	.00008	....	....	
19,000	19,000	.00092	.00004	....	....	
20,000	20,000	.00098	.00006	.00010	.00002	
21,000	21,000	.00104	.00006	....	....	
22,000	22,000	.00112	.00008	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00126	.00006	....	....	
25,000	25,000	.00132	.00006	.00020	.00010	
26,000	26,000	.00140	.00008	....	....	
27,000	27,000	.00150	.00010	....	....	
28,000	28,000	.00158	.00008	....	....	
29,000	29,000	.00170	.00012	....	....	
30,000	30,000	.00184	.00014	.00046	.00026	
31,000	31,000	.00200	.00016	....	....	
32,000	32,000	.00212	.00012	....	....	
33,000	33,000	.00232	.00020	....	....	
34,000	34,000	.00260	.00028	....	....	
35,000	35,000	.00290	.00030	.00126	.00080	
36,000	36,000	.00328	.00038	....	....	
37,000	37,000	.00360	.00032	....	....	
38,000	38,000	.00400	.00040	....	....	
39,000	39,000	.00444	.00044	....	....	
40,000	40,000	.00482	.00038	.00294	.00168	
41,000	41,000	.00520	.00038	....	....	
42,000	42,000	.00572	.00052	....	....	
43,000	43,000	.00620	.00048	....	....	
44,000	44,000	.00676	.00056	....	....	
45,000	45,000	.00738	.00062	.00516	.00222	
46,000	46,000	.00792	.00054	....	....	
47,000	47,000	.00838	.00046	....	....	
48,000	48,000	.00890	.00052	....	....	
49,000	49,000	.00940	.00050	....	....	
50,000	50,000	.01004	.00064	.00756	.00240	
63,500	63,500	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1044.

Marks, $\begin{matrix}12\ \mathrm{M\ R_{16}\ T\ R_1}\\ \mathrm{M\ T_{12}}\end{matrix}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	.0	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00062	.00004	....	....	
15,000	15,000	.00068	.00006	.00008	.00006	
16,000	16,000	.00074	.00006	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00084	.00004	....	....	
19,000	19,000	.00090	.00006	....	....	
20,000	20,000	.00096	.00006	.00012	.00004	
21,000	21,000	.00102	.00006	....	....	
22,000	22,000	.00108	.00006	....	....	
23,000	23,000	.00114	.00006	....	....	
24,000	24,000	.00120	.00006	....	....	
25,000	25,000	.00128	.00008	.00020	.00008	
26,000	26,000	.00136	.00008	....	....	
27,000	27,000	.00146	.00010	....	....	
28,000	28,000	.00154	.00008	....	....	
29,000	29,000	.00162	.00008	....	....	
30,000	30,000	.00170	.00008	.00040	.00020	
31,000	31,000	.00192	.00022	....	....	
32,000	32,000	.00200	.00008	....	....	
33,000	33,000	00214	.00014	....	....	
34,000	34,000	.00236	.00022	....	....	
35,000	35,000	.00258	.00022	.00096	.00056	
36,000	36,000	.00280	.00022	....	....	
37,000	37,000	.00310	.00030	....	....	
38,000	38,000	.00348	.00038	....	....	
39,000	39,000	.00392	.00044	....	....	
40,000	40,000	.00440	.00048	.00252	.00156	
41,000	41,000	.00488	.00048	....	....	
42,000	42,000	.00524	.00036	....	....	
43,000	43,000	.00560	.00036	....	....	
44,000	44,000	.00612	.00052	....	....	
45,000	45,000	.00680	.00068	.00464	.00212	
46,000	46,000	.00720	.00040	....	....	
47,000	47,000	.00756	.00036	....	....	
48,000	48,000	.00804	.00048	....	....	
49,000	49,000	.00840	.00036	....	....	
50,000	50,000	.00900	.00060	.00662	.00198	
62,760	62,760	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 17.

No. 4610.

Marks, $12\,M\,\underset{B\,T_1}{R_{17}}\,T\,R_2$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1.000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3.000	3,000	.000105	.000050	....	....	
4,000	4,000	.000160	.000055	....	....	
5,000	5,000	.000210	.000050	.000010	.000010	
6,000	6,000	.000275	.000065	....	....	
7,000	7,000	.000340	.000065	....	....	
8,000	8,000	.000395	.000055	....	....	
9,000	9,000	.000450	.000055	....	....	
10.000	10,000	.000505	.000055	.000035	.000025	
11,000	11,000	.000570	.000065	....	....	
12,000	12,000	.000640	.000070	.000055	.000020	
13.000	13,000	.000710	.000070	....	....	
14,000	14,000	.000790	.000080	.000090	.000035	
15,000	15,000	.000865	.090075	....	....	
16,000	16,000	.000959	.000085	.000125	.000035	
26,000	26,000	.003100	.002150	.001560	.001435	
26,820	26,820	....	....	....	....	Tensile strength.

Fractured 4″ from neck. Appearance, granular.

No. 4611.

Marks, $^{12\,\mathrm{M\,R_{II}\,T\,R_1}}_{\mathrm{M\,T_1}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000140	.000040	....	....	
5,000	5,000	.000185	.000045	.000005	.000005	
6,000	6,000	.000235	.000050	....	....	
7,000	7,000	.000285	.000050	....	....	
8,000	8,000	.000340	.000055	....	....	
9,000	9,000	.000390	.000050	....	....	
10,000	10,000	.000440	.000050	.000010	.000005	
11,000	11,000	.000495	.000055	....	....	
12,000	12,000	.000550	.000055	.000015	.000005	
13,000	13,000	.000605	.000055	....	....	
14,000	14,000	.000655	.000050	.000035	.000020	
15,000	15,000	.000715	.000060	....	....	
16,000	16,000	.000775	.000060	.000045	.000010	
17,000	17,000	.000845	.000070	....	....	
18,000	18,000	.000910	.000065	.000075	.000030	
19,000	19,000	.000985	.000075	....	....	
20,000	20,000	.001060	.000075	.000105	.000030	
21,000	21,000	.001150	.000090	....	....	
22,000	22,000	.001225	.000075	.000160	.000055	
23,000	23,000	.001340	.000115	....	....	
24,000	24,000	.001440	.000100	.000245	.000085	
25,000	25,000	.001575	.000135	.000325	.000080	
28,890	28,890	....	....	....	....	Tensile strength.

Fractured at neck. Appearance, granular.

No. 1019.

Marks, $\frac{12\,M\,R_{17}\,T\,R_2}{B\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00054	.00006	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00064	.00004	....	....	
14,000	14,000	.00068	.00004	....	....	
15,000	15,000	.00074	.00006	.00004	.00002	
16,000	16,000	.00078	.00004	....	....	
17,000	17,000	.00082	.00004	....	....	
18,000	18,000	.00090	.00008	....	....	
19,000	19,000	.00094	.00004	....	....	
20,000	20,000	.00100	.00006	.00010	.00006	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00130	.00010	....	....	
25,000	25,000	.00140	.00010	.00020	.00010	
26,000	26,000	.00148	.00008	....	....	
27,000	27,000	.00154	.00006	....	....	
28,000	28,000	.00164	.00010	....	....	
29,000	29,000	.00180	.00016	....	....	
30,000	30,000	.00196	.00016	.00050	.00030	
31,000	31,000	.00212	.00016	....	....	
32,000	32,000	.00230	.00018	....	....	
33,000	33,000	.00244	.00014	....	....	
34,000	34,000	.00274	.00020	....	....	
35,000	35,000	.00300	.00026	.00128	.00078	
36,000	36,000	.00328	.00028	....	....	
37,000	37,000	.00366	.00038	....	....	
38,000	38,000	.00404	.00038	....	....	
39,000	39,000	.00150	.00046	....	....	
40,000	40,000	.00500	.00050	.00290	.00162	
41,000	41,000	.00524	.00024	....	....	
42,000	42,000	.00566	.00042	....	....	
43,000	43,000	.00628	.00062	....	....	
44,000	44,000	.00670	.00042	....	....	
45,000	45,000	.00732	.00062	.00500	.00210	
46,000	46,000	.00780	.00048	....	....	
47,000	47,000	.00818	.00038	....	....	
48,000	48,000	.00870	.00052	....	....	
49,000	49,000	.00920	.00050	....	....	
50,000	50,000	.00978	.00058	.00720	.00220	
62,080	62,080	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1020.

Marks, $^{12}\underset{\mathrm{B\,R_{10}}}{\mathrm{M\,R_{17}\,T\,R_{2}}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00040	.00004	....	....	
10,000	10,000	.00044	.00004	.00004	.00004	
11,000	11,000	.00052	.00008	....	....	
12,000	12,000	.00056	.00004	....	....	
13,000	13,000	.00064	.00008	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00074	.00004	.00006	.00002	
16,000	16,000	.00078	.00004	....	....	
17,000	17,000	.00082	.00004	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00102	.00008	.00012	.00006	
21,000	21,000	.00106	.00004	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00118	.00006	....	....	
24,000	24,000	.00126	.00008	....	....	
25,000	25,000	.00134	.00008	.00022	.00010	
26,000	26,000	.00144	.00010	....	....	
27,000	27,000	.00152	.00008	....	....	
28,000	28,000	.00160	.00008	....	....	
29,000	29,000	.00172	.00012	....	....	
30,000	30,000	.00184	.00012	.00044	.00022	
31,000	31,000	.00204	.00020	....	....	
32,000	32,000	.00226	.00022	....	....	
33,000	33,000	.00240	.00014	....	....	
34,000	34,000	.00268	.00028	....	....	
35,000	35,000	.00300	.00032	.00130	.00086	
36,000	36,000	.00324	.00024	....	....	
37,000	37,000	.00360	.00036	....	....	
38,000	38,000	.00410	.00050	....	....	
39,000	39,000	.00446	.00038	....	....	
40,000	40,000	.00498	.00050	.00300	.00170	
41,000	41,000	.00548	.00050	....	....	
42,000	42,000	.00592	.00044	....	....	
43,000	43,000	.00638	.00046	....	....	
44,000	44,000	.00684	.00046	....	....	
45,000	45,000	.00748	.00064	.00500	.00200	
46,000	46,000	.00800	.00052	....	....	
47,000	47,000	.00856	.00056	....	....	
48,000	48,000	.00902	.00046	....	....	
49,000	49,000	.00970	.00068	....	....	
50,000	50,000	.01052	.00082	.00790	.00290	
64,950	64,950	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1021.

Marks, 12 M R, T R, M T,
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00046	.00004	....	....	
12,000	12,000	.00052	.00006	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00066	.00008	....	....	
15,000	15,000	.00070	.00004	.00006	.00004	
16,000	16,000	.00078	.00008	....	....	
17,000	17,000	.00084	.00006	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00098	.00008	....	....	
20,000	20,000	.00104	.00006	.00010	.00004	
21,000	21,000	.00112	.00008	....	....	
22,000	22,000	.00120	.00008	....	....	
23,000	23,000	.00126	.00006	....	....	
24,000	24,000	.00132	.00006	....	....	
25,000	25,000	.00140	.00008	.00020	.00010	
26,000	26,000	.00152	.00012	....	....	
27,000	27,000	.00162	.00010	....	....	
28,000	28,000	.00174	.00012	....	....	
29,000	29,000	.00186	.00012	....	....	
30,000	30,000	.00204	.00018	.00052	.00032	
31,000	31,000	.00218	.00014	....	....	
32,000	32,000	.00240	.00022	....	....	
33,000	33,000	.00262	.00022	....	....	
34,000	34,000	.00286	.00024	....	....	
35,000	35,000	.00320	.00034	.00142	.00090	
36,000	36,000	.00372	.00052	....	....	
37,000	37,000	.00394	.00022	....	....	
38,000	38,000	.00444	.00050	....	....	
39,000	39,000	.00504	.00060	....	....	
40,000	40,000	.00550	.00046	.00340	.00198	
41,000	41,000	.00600	.00050	....	....	
42,000	42,000	.00652	.00052	....	....	
43,000	43,000	.00704	.00052	....	....	
44,000	44,000	.00782	.00078	....	....	
45,000	45,000	.00870	.00088	.00620	.00280	
46,000	46,000	.00926	.00056	....	....	
47,000	47,000	.00992	.00066	....	....	
48,000	48,000	.01072	.00080	....	....	
49,000	49,000	.01176	.00104	....	....	
50,000	50,000	.01290	.00114	.01000	.00380	
58,000	58,000	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 18.

No. 4612.

Marks, $\genfrac{}{}{0pt}{}{12\ \mathrm{M}\ \mathrm{R}_{18}\ \mathrm{T}\ \mathrm{R}_2}{\mathrm{B}\ \mathrm{T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000110	.000055	....	....	
4,000	4,000	.000165	.000055	....	....	
5,000	5,000	.000215	.000050	0.	....	
6,000	6,000	.000270	.000055	....	....	
7,000	7,000	.000325	.000055	....	....	
8,000	8,000	.000380	.000055	....	....	
9,000	9,000	.000445	.000065	....	....	
10,000	10,000	.000505	.000060	.000035	.000035	
11,000	11,000	.000570	.000065	....	....	
12,000	12,000	.000640	.000070	.000060	.000025	
13,000	13,000	.000710	.000070	....	....	
14,000	14,000	.000785	.000075	.000095	.000035	
15,000	15,000	.000860	.000075	....	....	
16,000	16,000	.000945	.000085	.000140	.000045	
17,000	17,000	.001030	.000085	....	....	
18,000	18,000	.001140	.000110	.000200	.000060	
19,000	19,000	.001250	.000110	....	....	
20,000	20,000	.001370	.000120	.000300	.000100	
21,000	21,000	.001525	.000155	....	....	
22,000	22,000	.001700	.000175	.000475	.000175	
23,000	23,000	.001900	.000200	....	....	
24,000	24,000	.002100	.000200	.000740	.000265	
25,000	25,000	.002400	.000300	.000950	.000210	
27,660	27,660	....	....	....	....	Tensile strength.

Fractured 3″.7 from neck. Appearance, granular.

No. 4613.

Marks, $\overset{12\,\mathrm{M}\,\mathrm{R}_{11}\,\mathrm{T}\,\mathrm{R}_1}{\mathrm{M}\,\mathrm{T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000095	.000045	....	....	
4,000	4,000	.000140	.000045	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000240	.000050	....	....	
7,000	7,000	.000295	.000055	....	....	
8,000	8,000	.000345	.000050	....	....	
9,000	9,000	.000400	.000055	....	....	
10,000	10,000	.000455	.000055	.000015	.000015	
11,000	11,000	.000505	.000050	....	....	
12,000	12,000	.000560	.000055	.000030	.000015	
13,000	13,000	.000625	.000065	....	....	
14,000	14,000	.000690	.000065	.000045	.000015	
15,000	15,000	.000750	.000060	....	....	
16,000	16,000	.000810	.000060	.000065	.000020	
17,000	17,000	.000885	.000075	....	....	
18,000	18,000	.000960	.000075	.000095	.000030	
19,000	19,000	.001050	.000090	....	....	
20,000	20,000	.001170	.000120	.000150	.000055	
21,000	21,000	.001240	.000070	....	....	
22,000	22,000	.001320	.000080	.000225	.000075	
23,000	23,000	.001445	.000125	....	....	
24,000	24,000	.001555	.000110	.000350	.000125	
25,000	25,000	.001725	.000170	.000440	.000090	
29,610	29,610	....	....	....	....	Tensile strength.

Fractured 10″.2 from neck. Appearance, granular.

No. 1022.

Marks, $^{12\ M\ R_{18}\ T\ R_2}_{\quad B\ T_2}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00018	.00006	0.		
6,000	6,000	.00022	.00004			
7,000	7,000	.00028	.00006			
8,000	8,000	.00032	.00004			
9,000	9,000	.00040	.00008			
10,000	10,000	.00046	.00006	.00002	.00002	
11,000	11,000	.00050	.00004			
12,000	12,000	.00058	.00008			
13,000	13,000	.00064	.00006			
14,000	14,000	.00070	.00006			
15,000	15,000	.00074	.00004	.00006	.00004	
16,000	16,000	.00080	.00006			
17,000	17,000	.00084	.00004			
18,000	18,000	.00090	.00006			
19,000	19,000	.00098	.00008			
20,000	20,000	.00104	.00006	.00010	.00004	
21,000	21,000	.00110	.00006			
22,000	22,000	.00118	.00008			
23,000	23,000	.00126	.00008			
24,000	24,000	.00132	.00006			
25,000	25,000	.00140	.00008	.00024	.00014	
26,000	26,000	.00152	.00012			
27,000	27,000	.00162	.00010			
28,000	28,000	.00172	.00010			
29,000	29,000	.00182	.00010			
30,000	30,000	.00198	.00016	.00056	.00032	
31,000	31,000	.00212	.00014			
32,000	32,000	.00230	.00018			
33,000	33,000	.00254	.00024			
34,000	34,000	.00280	.00026			
35,000	35,000	.00312	.00032	.00140	.00084	
36,000	36,000	.00350	.00038			
37,000	37,000	.00384	.00034			
38,000	38,000	.00424	.00040			
39,000	39,000	.00444	.00020			
40,000	40,000	.00520	.00076	.00320	.00180	
41,000	41,000	.00554	.00034			
42,000	42,000	.00590	.00036			
43,000	43,000	.00650	.00060			
44,000	44,000	.00690	.00040			
45,000	45,000	.00752	.00062	.00530	.00210	
46,000	46,000	.00816	.00064			
47,000	47,000	.00840	.00024			
48,000	48,000	.00870	.00030			
49,000	49,000	.00920	.00050			
50,000	50,000	.00960	.00040	.00700	.00170	
61,100	61,100					Ultimate strength.

Failed by triple flexure.

No. 1023.

Marks, $^{12\,M\,R_{18}\,T\,R_{2}}_{B\,R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00020	.00004	.00004	.00004	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00048	.00008	.00006	.00002	
11,000	11,000	.00054	.00006	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00072	.00006	....	....	
15,000	15,000	.00076	.00004	.00010	.00004	
16,000	16,000	.00084	.00008	....	....	
17,000	17,000	.00092	.00008	....	....	
18,000	18,000	.00098	.00006	....	....	
19,000	19,000	.00102	.00004	....	....	
20,000	20,000	.00108	.00006	.00018	.00008	
21,000	21,000	.00114	.00006	....	....	
22,000	22,000	.00120	.00006	....	....	
23,000	23,000	.00128	.00008	....	....	
24,000	24,000	.00136	.00008	....	....	
25,000	25,000	.00142	.00006	.00030	.00012	
26,000	26,000	.00152	.00010	....	....	
27,000	27,000	.00162	.00010	....	....	
28,000	28,000	.00170	.00008	....	....	
29,000	29,000	.00182	.00012	....	....	
30,000	30,000	.00194	.00012	.00056	.00026	
31,000	31,000	.00216	.00022	....	....	
32,000	32,000	.00232	.00016	....	....	
33,000	33,000	.00254	.00022	....	....	
34,000	34,000	.00286	.00032	....	....	
35,000	35,000	.00320	.00034	.00150	.00094	
36,000	36,000	.00362	.00042	....	....	
37,000	37,000	.00394	.00032	....	....	
38,000	38,000	.00436	.00012	....	....	
39,000	39,000	.00464	.00028	....	....	
40,000	40,000	.00540	.00076	.00344	.00194	
41,000	41,000	.00590	.00050	....	....	
42,000	42,000	.00638	.00048	....	....	
43,000	43,000	.00674	.00036	....	....	
44,000	44,000	.00738	.00064	....	....	
45,000	45,000	.00824	.00086	.00590	.00246	
46,000	46,000	.00880	.00056	....	....	
47,000	47,000	.00930	.00050	....	....	
48,000	48,000	.01010	.00080	....	....	
49,000	49,000	.01080	.00070	....	....	
50,000	50,000	.01192	.00112	.00920	.00330	
61,280	61,280	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1024.

Marks, $\underset{\mathrm{M\,T_2}}{\mathrm{12\,M\,R_{18}\,T\,R_1}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006			
3,000	3,000	.00010	.00004			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00024	.00006			
7,000	7,000	.00028	.00004			
8,000	8,000	.00034	.00006			
9,000	9,000	.00040	.00006			
10,000	10,000	.00046	.00006	.00006	.00004	
11,000	11,000	.00054	.00008			
12,000	12,000	.00060	.00006			
13,000	13,000	.00066	.00006			
14,000	14,000	.00070	.00004			
15,000	15,000	.00076	.00006	.00010	.00004	
16,000	16,000	.00082	.00006			
17,000	17,000	.00088	.00006			
18,000	18,000	.00094	.00006			
19,000	19,000	.00100	.00006			
20,000	20,000	.00106	.00006	.00016	.00006	
21,000	21,000	.00112	.00006			
22,000	22,000	.00120	.00608			
23,000	23,000	.00126	.00006			
24,000	24,000	.00132	.00006			
25,000	25,000	.00140	.00008	.00026	.00010	
26,000	26,000	.00150	.00010			
27,000	27,000	.00160	.00010			
28,000	28,000	.00170	.00010			
29,000	29,000	.00182	.00012			
30,000	30,000	.00196	.00014	.00052	.00026	
31,000	31,000	.00212	.00016			
32,000	32,000	.00230	.00018			
33,000	33,000	.00250	.00020			
34,000	34,000	.00276	.00026			
35,000	35,000	.00302	.00026	.00132	.00080	
36,000	36,000	.00348	.00046			
37,000	37,000	.00380	.00032			
38,000	38,000	.00420	.00040			
39,000	39,000	.00464	.00044			
40,000	40,000	.00520	.00056	.00320	.00188	
41,000	41,000	.00570	.00050			
42,000	42,000	.00596	.00026			
43,000	43,000	.00660	.00064			
44,000	44,000	.00700	.00040			
45,000	45,000	.00750	.00050	.00540	.00220	
46,000	46,000	.00840	.00090			
47,000	47,000	.00898	.00058			
48,000	48,000	.00936	.00038			
49,000	49,000	.01010	.00074			
50,000	50,000	.01080	.00070	.00810	.00270	
60,990	60,990					Ultimate strength.

Failed by triple flexure.

BODY NO. 19.

No. 4677.

Marks, $\overset{12\,M\,R_{19}\,T\,R_2}{B\,T_1}$
Diameter, 1″.29.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000410	.000060	....	....	
10,000	10,000	.000465	.000055	.000015	.000015	
11,000	11,000	.000535	.000070	....	....	
12,000	12,000	.000600	.000065	.000045	.000030	
13,000	13,000	.000670	.000070	....	....	
14,000	14,000	.000745	.000075	.000060	.000015	
15,000	15,000	.000820	.000075	....	....	
16,000	16,000	.000900	.000080	.000100	.000040	
17,000	17,000	.000905	.000095	....	....	
18,000	18,000	.001100	.000105	.000165	.000065	
19,000	19,000	.001200	.000100	....	....	
20,000	20,000	.001340	.000140	.000275	.000110	
21,000	21,000	.001495	.000155	....	....	
22,000	22,000	.001660	.000165	.000460	.000185	
23,000	23,000	.001850	.000190	....	....	
24,000	24,000	.002150	.000300	.000820	.000360	
25,000	25,000	.002440	.000290	.001000	.000180	
26,610	26,610	....	....	....	....	Tensile strength.

Fractured 4″.8 from neck. Appearance, granular.

No. 4678.

Marks, $^{12\ \mathrm{M\ R_{19}\ T\ R_1}}_{\mathrm{M\ T_1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000405	.000055	....	....	
10,000	10,000	.000455	.000050	.000015	.000015	
11,000	11,000	.000520	.000065	....	....	
12,000	12,000	.000585	.000065	.000045	.000030	
13,000	13,000	.000645	.000060	....	....	
14,000	14,000	.000700	.000055	.000055	.000010	
15,000	15,000	.000775	.000075	....	....	
16,000	16,000	.000850	.000075	.000095	.000040	
17,000	17,000	.000925	.000075	....	....	
18,000	18,000	.001005	.000080	.000145	.000050	
19,000	19,000	.001100	.000095	....	....	
20,000	20,000	.001200	.000100	.000205	.000060	
21,000	21,000	.001320	.000120	....	....	
22,000	22,000	.001450	.000130	.000315	.000110	
23,000	23,000	.001620	.000170	....	....	
24,000	24,000	.001795	.000175	.000540	.000225	
25,000	25,000	.002015	.000220	.000695	.000155	
26,010	26,010	....	....	....	....	Tensile strength.

Fractured 11″ from neck. Appearance, granular.

1045.

Marks, $^{12\ M\ R_{19}\ T\ R_{2}}_{B\ T_{2}}$.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00018	.00006	0.		
6,000	6,000	.00022	.00004			
7,000	7,000	.00026	.00004			
8,000	8,000	.00032	.00006			
9,000	9,000	.00038	.00006			
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006			
12,000	12,000	.00056	.00006			
13,000	13,000	.00058	.00002			
14,000	14,000	.00064	.00006			
15,000	15,000	.00070	.00006	.00004	.00002	
16,000	16,000	.00076	.00006			
17,000	17,000	.00082	.00006			
18,000	18,000	.00088	.00006			
19,000	19,000	.00094	.00006			
20,000	20,000	.00102	.00008	.00010	.00006	
21,000	21,000	.00108	.00006			
22,000	22,000	.00116	.00008			
23,000	23,000	.00122	.00006			
24,000	24,000	.00130	.00008			
25,000	25,000	.00140	.00010	.00020	.00010	
26,000	26,000	.00150	.00010			
27,000	27,000	.00158	.00008			
28,000	28,000	.00170	.00012			
29,000	29,000	.00180	.00010			
30,000	30,000	.00196	.00016	.00052	.00032	
31,000	31,000	.00214	.00018			
32,000	32,000	.00234	.00020			
33,000	33,000	.00250	.00016			
34,000	34,000	.00280	.00030			
35,000	35,000	.00310	.00030	.00140	.00088	
36,000	36,000	.00348	.00038			
37,000	37,000	.00380	.00032			
38,000	38,000	.00430	.00050			
39,000	39,000	.00472	.00042			
40,000	40,000	.00540	.00068	.00340	.00200	
41,000	41,000	.00590	.00050			
42,000	42,000	.00640	.00050			
43,000	43,000	.00688	.00048			
44,000	44,000	.00756	.00068			
45,000	45,000	.00832	.00076	.00600	.00260	
46,000	46,000	.00890	.00058			
47,000	47,000	.00942	.00052			
48,000	48,000	.01032	.00090			
49,000	49,000	.01120	.00088			
50,000	50,000	.01230	.00110	.00956	.00356	
59,720	59,720					Ultimate strength.

Failed by triple flexure.

No. 1046.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{19}\,\mathrm{T}\,\mathrm{R}_2}_{\mathrm{B}\,\mathrm{R}_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00020	.00004	....	....	
7,000	7,000	.00026	.00006	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9,000	.00036	.00006	....	....	
10,000	10,000	.00042	.00006	.00002	.00002	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00070	.00006	.00002	0.	
16,000	16,000	.00074	.00004	....	....	
17,000	17,000	.00080	.00006	....	....	
18,000	18,000	.00086	.00006	....	....	
19,000	19,000	.00092	.00006	....	....	
20,000	20,000	.00098	.00006	.00008	.00006	
21,000	21,000	.00104	.00006	....	....	
22,000	22,000	.00112	.00008	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00126	.00006	....	....	
25,000	25,000	.00132	.00006	.00020	.00012	
26,000	26,000	.00138	.00006	....	....	
27,000	27,000	.00148	.00010	....	....	
28,000	28,000	.00158	.00010	....	....	
29,000	29,000	.00168	.00010	....	....	
30,000	30,000	.00184	.00016	.00046	.00026	
31,000	31,000	.00206	.00022	....	....	
32,000	32,000	.00226	.00020	....	....	
33,000	33,000	.00250	.00024	....	....	
34,000	34,000	.00270	.00020	....	....	
35,000	35,000	.00302	.00032	.00140	.00094	
36,000	36,000	.00342	.00040	....	....	
37,000	37,000	.00386	.00044	....	....	
38,000	38,000	.00422	.00036	....	....	
39,000	39,000	.00470	.00048	....	....	
40,000	40,000	.00512	.00042	.00330	.00190	
41,000	41,000	.00560	.00048	....	....	
42,000	42,000	.00592	.00032	....	....	
43,000	43,000	.00640	.00048	....	....	
44,000	44,000	.00692	.00052	....	....	
45,000	45,000	.00766	.00074	.00546	.00216	
46,000	46,000	.00808	.00042	....	....	
47,000	47,000	.00840	.00032	....	....	
48,000	48,000	.00870	.00030	....	....	
49,000	49,000	.00896	.00026	....	....	
50,000	50,000	.00908	.00012	.00678	.00132	
58,640	58,640	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1047.

Marks, $^{12\,M\,R_1,\,T\,B_1}_{M\,T_2}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00070	.00004	.00004	.00002	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00100	.00006	.00010	.00006	
21,000	21,000	.00108	.00008	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00120	.00006	....	....	
24,000	24,000	.00128	.00008	....	....	
25,000	25,000	.00138	.00010	.00022	.00012	
26,000	26,000	.00150	.00012	....	....	
27,000	27,000	.00158	.00008	....	....	
28,000	28,000	.00168	.00010	....	....	
29,000	29,000	.00178	.00010	....	....	
30,000	30,000	.00192	.00014	.00052	.00030	
31,000	31,000	.00210	.00018	....	....	
32,000	32,000	.00230	.00020	....	....	
33,000	33,000	.00250	.00020	....	....	
34,000	34,000	.00280	.00030	....	....	
35,000	35,000	.00316	.00036	.00150	.00098	
36,000	36,000	.00364	.00048	....	....	
37,000	37,000	.00414	.00050	....	....	
38,000	38,000	.00456	.00042	....	....	
39,000	39,000	.00502	.00046	....	....	
40,000	40,000	.00574	.00072	.00376	.00226	
41,000	41,000	.00630	.00056	....	....	
42,000	42,000	.00660	.00030	....	....	
43,000	43,000	.00730	.00070	....	....	
44,000	44,000	.00812	.00082	....	....	
45,000	45,000	.00892	.00080	.00662	.00286	
46,000	46,000	.01002	.00110	....	....	
47,000	47,000	.01092	.00090	....	....	
50,000	50,000	.01590	.00498	.01300	.00638	
57,980	57,980	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 20.

No. 4681.

Marks, $\genfrac{}{}{0pt}{}{12\,\mathrm{M\,R_{20}\,T\,R_2}}{\mathrm{B\,T_1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000160	.000055	....	....	
5,000	5,000	.000210	.000050	0.	....	
6,000	6,000	.000265	.000055	....	....	
7,000	7,000	.000320	.000055	....	....	
8,000	8,000	.000380	.000060	....	....	
9,000	9,000	.000440	.000060	....	....	
10,000	10,000	.000500	.000060	.000015	.000015	
11,000	11,000	.000555	.000055	....	....	
12,000	12,000	.000625	.000070	.000045	.000030	
13,000	13,000	.000700	.000075	....	....	
14,000	14,000	.000765	.000065	.000055	.000010	
15,000	15,000	.000850	.000075	....	....	
16,000	16,000	.000940	.000090	.000100	.000045	
17,000	17,000	.001030	.000090	....	....	
18,000	18,000	.001135	.000105	.000165	.000065	
19,000	19,000	.001250	.000115	....	....	
20,000	20,000	.001375	.000125	.000275	.000110	
21,000	21,000	.001540	.000165	....	....	
22,000	22,000	.001710	.000170	.000475	.000200	
23,000	23,000	.001960	.000250	....	....	
24,000	24,000	.002225	.000265	.000800	.000325	
25,000	25,000	.002550	.000275	.001050	.000250	
26,220	26,220	....	....	....	....	Tensile strength.

Fractured 9″ from neck. Appearance, granular,

No. 4682.

Marks, $^{12}\mathrm{M}\,\underset{\mathrm{M\,T_1}}{\mathrm{R_8}}\,\mathrm{T\,R_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1.000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7.000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000400	.000050	....	....	
10,000	10,000	.000450	.000050	.000010	.000010	
11.000	11,000	.000500	.000050	....	....	
12.000	12,000	.000555	.000055	.000025	.000015	
13,000	13,000	.000615	.000060	....	....	
14,000	14,000	.000675	.000060	.000050	.000025	
15,000	15,000	.000740	.000065	....	....	
16,000	16,000	.000805	.000065	.000060	.000010	
17,000	17,000	.000885	.000080	....	....	
18,000	18,000	.000950	.000065	.000100	.000040	
19,000	19,000	.001050	.000100	....	....	
20,000	20,000	.001115	.000065	.000150	.000050	
21,000	21,000	.001235	.000120	....	....	
22,000	22,000	.001330	.000105	.000245	.000095	
23,000	23,000	.001455	.000125	....	....	
24,000	24,000	.001595	.000140	.000385	.000140	
25,000	25,000	.001800	.000205	.000505	.000120	
29,440	29,440	....	....	....	....	Tensile strength.

Fractured 10″.9 from neck. Appearance, granular.

No. 1048.

Marks, $^{12\,M\,R_{3}\,T\,R_{6}}_{\quad B\,T_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00019	.00005	.00004	.00004	
6,000	6,000	.00024	.00005	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00044	.00006	.00016	.00012	
11,000	11,000	.00052	.00008	....	....	
12,000	12,000	.00056	.00004	....	....	
13,000	13,000	.00062	.00006	....	....	
14,000	14,000	.00068	.00006	....	....	
15,000	15,000	.00072	.00004	.00024	.00008	
16,000	16,000	.00080	.00008	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00092	.00006	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00106	.00008	.00030	.00006	
21,000	21,000	.00112	.00006	....	....	
22,000	22,000	.00120	.00008	....	....	
23,000	23,000	.00128	.00008	....	....	
24,000	24,000	.00134	.00006	....	....	
25,000	25,000	.00144	.00010	.00042	.00012	
26,000	26,000	.00152	.00008	....	....	
27,000	27,000	.00164	.00012	....	....	
28,000	28,000	.00172	.00008	....	....	
29,000	29,000	.00184	.00012	....	....	
30,000	30,000	.00200	.00016	.00068	.00026	
31,000	31,000	.00220	.00020	....	....	
32,000	32,000	.00236	.00016	....	....	
33,000	33,000	.00256	.00020	....	....	
34,000	34,000	.00280	.00024	....	....	
35,000	35,000	.00316	.00036	.00154	.00086	
36,000	36,000	.00348	.00032	....	....	
37,000	37,000	.00380	.00032	....	....	
38,000	38,000	.00412	.00032	....	....	
39,000	39,000	.00460	.06048	....	....	
40,000	40,000	.00510	.00050	.00324	.00170	
41,000	41,000	.00562	.00052	....	....	
42,000	42,000	.00596	.00034	....	....	
43,000	43,000	.00640	.00044	....	....	
44,000	44,000	.00680	.00040	....	....	
45,000	45,000	.00752	.00072	.00532	.00208	
46,000	46,000	.00798	.00046	....	....	
47,000	47,000	.00848	.00050	....	....	
48,000	48,000	.00892	.00044	....	....	
49,000	49,000	.00960	.00068	....	....	
50,000	50,000	.01040	.00080	.00788	.00256	
62,350	62,350	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1049.

Marks, $\overset{12\,M\,R_{70}\,T\,R_{9}}{B\,R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00020	.00002	....	....	
7,000	7,000	.00024	.00004	....	....	
8,000	8,000	.00028	.00004	....	....	
9,000	9,000	.00032	.00004	....	....	
10,000	10,000	.00036	.00004	.00010	.00010	
11,000	11,000	.00042	.00006	....	....	
12,000	12,000	.00048	.00006	....	....	
13,000	13,000	.00052	.00004	....	....	
14,000	14,000	.00056	.00004	....	....	
15,000	15,000	.00060	.00004	.00016	.00006	
16,000	16,000	.00068	.00008	....	....	
17,000	17,000	.00072	.00004	....	....	
18,000	18,000	.00078	.00006	....	....	
19,000	19,000	.00082	.00004	....	....	
20,000	20,000	.00088	.00006	.00020	.00004	
21,000	21,000	.00096	.00008	....	....	
22,000	22,000	.00106	.00010	....	....	
23,000	23,000	·00112	.00006	....	....	
24,000	24,000	.00118	.00006	....	....	
25,000	25,000	.00126	.00008	.00034	.00014	
26,000	26,000	.00140	.00014	....	....	
27,000	27,000	.00148	.00008	....	....	
28,000	28,000	.00158	.00010	....	....	
29,000	29,000	.60170	.00012	....	....	
30,000	30,000	.00186	.00016	.00066	.00032	
31,000	31,000	.00208	.00022	....	....	
32,000	32,000	.00222	.00014	....	....	
33,000	33,000	.00242	.00020	....	....	
34,000	34,000	.00272	.00030	....	....	
35,000	35,000	.00308	.00036	.00160	.00094	
36,000	36,000	.00350	.00042	....	....	
37,000	37,000	.00386	.00036	....	....	
38,000	38,000	.00416	.00030	....	....	
39,000	39,000	.00452	.00036	....	....	
40,000	40,000	.00520	.00068	.00348	.00188	
41,000	41,000	.00562	.00042	....	....	
42,000	42,000	.00592	.00030	....	....	
43,000	43,000	.00620	.00028	....	....	
44,000	44,000	.00660	.00040	....	....	
45,000	45,000	.00750	.00090	.00552	.00204	
46,000	46,000	.00798	.00048	....	....	
47,000	47,000	.00834	.00036	....	....	
48,000	48,000	.00868	.00034	....	....	
49,000	49,000	.00920	.00052	....	....	
50,000	50,000	.00970	.00050	.00750	.00198	
61,980	61,980	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1050.

Marks, $\genfrac{}{}{0pt}{}{12\,M\,R_{10}\,T\,R_1}{M\,T_1}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00008	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00016	.00004	0.	....	
6,000	6,000	.00020	.00004	....	....	
7,000	7,000	.00026	.00006	....	....	
8,000	8,000	.00032	.00006	....	....	
9,000	9,000	.00036	.00004	....	....	
10,000	10,000	.00042	.00006	0.	....	
11,000	11,000	.00046	.00004	....	....	
12,000	12,000	.00052	.00006	....	....	
13,000	13,000	.00056	.00004	....	....	
14.000	14,000	.00062	.00006	....	....	
15,000	15,000	.00068	.00006	.00002	.00002	
16,000	16,000	.00074	.00006	....	....	
17,000	17.000	.00080	.00006	....	....	
18,000	18.000	.00086	.00006	....	....	
19,000	19,000	.00094	.00008	....	....	
20,000	20,000	.00100	.00006	.00006	.00004	
21,000	21,000	.00104	.00004	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00116	.00006	....	....	
24,000	24,000	.00122	.00006	....	....	
25,000	25,000	.00130	.00008	.00012	.00006	
26,000	26,000	.00140	.00010	....	....	
27,000	27,000	.00150	.00010	....	....	
28,000	28.000	.00160	.00010	....	....	
29.000	29,000	.00170	.00010	....	....	
30,000	30.000	.00184	.00014	.00040	.00028	
31,000	31.000	.00202	.00018	....	....	
32,000	32,000	.00220	.00018	....	....	
33.000	33,000	.00248	.00028	....	....	
34.000	34,000	.00264	.00016	....	....	
35,000	35.000	.00300	.00036	.00130	.00090	
36,000	36.000	.00340	.00040	....	....	
37,000	37,000	.00370	.00030	....	....	
38,000	38,000	.00400	.00030	....	....	
39,000	39.000	.00142	.00042	....	....	
40,000	40,000	.00498	.00056	.00302	.00172	
42,000	42,000	.00618	.00064	....	....	
43,000	43,000	.00688	.00070	....	....	
44,000	44.000	.00742	.00054	....	....	
45.000	45,000	.00796	.00054	.00564	.00262	
46,000	46,000	.00880	.00084	....	....	
47,000	47,009	.00966	.00086	....	....	
48,000	48,000	.01040	.00074	....	....	
49,000	49,000	.01124	.00084	....	....	
50,000	50,000	.01250	.00126	.00970	.00406	
59,700	59,700	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 20 (second casting).

No. 4715.

Marks, $\overset{12\,\mathrm{M\,R_{n}\,T\,R_2}}{\mathrm{B\,T_{11}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000095	.000050	....	....	
4,000	4,000	.000145	.000050	....	....	
5,000	5,000	.000195	.000050	0.	....	
6,000	6,000	.000250	.000055	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000400	.000050	....	....	
10,000	10,000	.000455	.000055	.000025	.000025	
11,000	11,000	.000525	.000070	....	....	
12,000	12,000	.000590	.000065	.000045	.000020	
13,000	13,000	.000650	.000060	....	....	
14,000	14,000	.000710	.000060	.000060	.000015	
15,000	15,000	.000785	.000075	....	....	
16,000	16,000	.000855	.000070	.000100	.000040	
17,000	17,000	.000950	.000095	....	....	
18,000	18,000	.001045	.000095	.000150	.000050	
19,000	19,000	.001150	.000105	....	....	
20,000	20,000	.001245	.000005	.000245	.000095	
21,000	21,000	.001360	.000115	....	....	
22,000	22,000	.001515	.000155	.000390	.000145	
23,000	23,000	.001705	.000190	....	....	
24,000	24,000	.001920	.000215	.000640	.000250	
25,000	25,000	.002165	.000245	.000830	.000190	
25,710	25,710	....	....	....	....	Tensile strength.

Fractured 4″.8 from neck. Appearance, granular.

No. 4716.

Marks, $\overset{12\,M\,R_{8}\,T\,R_{1}}{M\,T_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000090	.000045	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000190	.000050	0.	....	
6,000	6,000	.000235	.000045	....	....	
7,000	7,000	.000285	.000050	....	....	
8,000	8,000	.000330	.000045	....	....	
9,000	9,000	.000385	.000055	....	....	
10,000	10,000	.000430	.000045	.000005	.000005	
11,000	11,000	.000490	.000060	....	....	
12,000	12,000	.000545	.000055	.000020	.000015	
13,000	13,000	.000590	.000045	....	....	
14,000	14,000	.000650	.000060	.000045	.000025	
15,000	15,000	.000710	.000060	....	....	
16,000	16,000	.000775	.000065	.000060	.000015	
17,000	17,000	.000835	.000060	....	....	
18,000	18,000	.000900	.000065	.000095	.000035	
19,000	19,000	.000980	.000080	....	....	
20,000	20,000	.001055	.000075	.000130	.000035	
21,000	21,000	.001150	.000095	....	....	
22,000	22,000	.001230	.000080	.000200	.000070	
23,000	23,000	.001340	.000110	....	....	
24,000	24,000	.001450	.000110	.000300	.000100	
25,000	25,000	.001600	.000150	.000390	.000090	
28,820	28,820	....	....	....	....	Tensile strength.

Fractured 11″.5 from neck. Appearance, granular.

No. 1073.

Marks, $^{12\,M\,R_{70}\,T\,R_{8}}_{B\,T_{12}}$
Length, 10″.5.
Diametér, 1″.129.
Sectional area, 1 square inch.
Ganged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00010	.00004	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00020	.00004	.00002	.00002	
6,000	6,000	.00028	.00008	....	....	
7,000	7,000	.00032	.00004	....	....	
8,000	8,000	.00038	.00006	....	....	
9,000	9,000	.00042	.00004	....	....	
10,000	10,000	.00048	.00006	.00006	.00004	
11,000	11,000	.00054	.00006	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00070	.00004	....	....	
15,000	15,000	.00076	.00006	.00010	.00004	
16,000	16,000	.00080	.00004	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00092	.00006	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00106	.00008	.00016	.00006	
21,000	21,000	.00112	.00006	....	....	
22,000	22,000	.00118	.00006	....	....	
23,000	23,000	.00128	.00010	....	....	
24,000	24,000	.00136	.00008	....	....	
25,000	25,000	.00142	.00006	.00026	.00010	
26,000	26,000	.00152	.00010	....	....	
27,000	27,000	.00160	.00008	....	....	
28,000	28.000	.00170	.00010	....	....	
29,000	29,000	.00182	.00012	....	....	
30,000	30,000	.00196	.00014	.00052	.00026	
31,000	31,000	.00210	.00014	....	....	
32,000	32,000	.00224	.00014	....	....	
33,000	33,000	.00248	.00024	....	....	
34,000	34,000	.00276	.00028	....	....	
35,000	35,000	.00302	.00926	.00136	.00084	
36,000	36,000	.00340	.00038	....	....	
37,000	37,000	.00380	.00040	....	....	
38,000	38,000	.00428	.00048	....	....	
39,000	39,000	.00480	.00052	....	....	
40,000	40,000	.00534	.00054	.00336	.00200	
41,000	41,000	.00572	.00038	....	....	
42,000	42,000	.00630	.00058	....	....	
43,000	43,000	.00698	.00068	....	....	
44,000	44,000	.00752	.00054	....	....	
45,000	45,000	.00820	.00068	.00600	.00264	
46,000	46,000	.00870	.00050	....	....	
47,000	47,000	.00960	.00090	....	....	
48,000	48,000	.01046	.00086	....	....	
49,000	49,000	.01130	.00084	....	....	
50,000	50,000	.01272	.00042	.01000	.00400	
60,670	60,670	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1074.

Marks, ^{12}M R T R B R.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	.00006	.00004	
11,000	11,000	.00050	.00008	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00070	.00006	.00010	.00004	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00092	.00004	....	....	
20,000	20,000	.00100	.00008	.00014	.00004	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00118	.00006	....	....	
24,000	24,000	.00126	.00008	....	....	
25,000	25,000	.00134	.00008	.00024	.00010	
26,000	26,000	.00142	.00008	....	....	
27,000	27,000	.00152	.00010	....	....	
28,000	28,000	.00160	.00008	....	....	
29,000	29,000	.00172	.00012	....	....	
30,000	30,000	.00188	.00016	.00052	.00028	
31,000	31,000	.00204	.00016	....	....	
32,000	32,000	.00220	.00016	....	....	
33,000	33,000	.00244	.00024	....	....	
34,000	34,000	.00272	.00028	....	....	
35,000	35,000	.00310	.00038	.00148	.00096	
36,000	36,000	.00344	.00034	....	....	
37,000	37,000	.00380	.00036	....	....	
38,000	38,000	.00422	.00042	....	....	
39,000	39,000	.00474	.00052	....	....	
40,000	40,000	.00522	.00048	.00350	.00202	
41,000	41,000	.00560	.00038	....	....	
42,000	42,000	.00622	.00062	....	....	
43,000	43,000	.00680	.00058	....	....	
44,000	44,000	.00732	.00052	....	....	
45,000	45,000	.00802	.00070	.00580	.00230	
46,000	46,000	.00878	.00076	....	....	
47,000	47,000	.00924	.00046	....	....	
48,000	48,000	.00992	.00068	....	....	
49,000	49,000	.01076	.00084	....	....	
50,000	50,000	.01168	.00092	.00906	.00326	
60,200	60,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1075.

Marks, $^{12\text{ M R, T R,}}_{\text{M T}_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1, 000	1, 000	0.	0.	0.	0.	Initial load.
2, 000	2, 000	.00004	.00004	....	....	
3, 000	3, 000	.00010	.00006	....	....	
4, 000	4, 000	.00014	.00004	....	....	
5, 000	5, 000	.00018	.00004	0.	....	
6, 000	6, 000	.00022	.00004	....	....	
7, 000	7, 000	.00028	.00006	....	....	
8, 000	8, 000	.00032	.00004	....	....	
9, 000	9, 000	.00038	.00006	....	....	
10, 000	10, 000	.00042	.00004	0.	....	
11, 000	11, 000	.00046	.00004	....	....	
12, 000	12, 000	.00052	.00006	....	....	
13, 000	13, 000	.00058	.00006	....	....	
14, 000	14, 000	.00062	.00004	....	....	
15, 000	15, 000	.00068	.00006	.00002	.00002	
16, 000	16, 000	.00072	.00004	....	....	
17, 000	17, 000	.00078	.00006	....	....	
18, 000	18, 000	.00084	.00006	....	....	
19, 000	19, 000	.00088	.00004	....	....	
20, 000	20, 000	.00094	.00006	.00006	.00004	
21, 000	21, 000	.00100	00006	....	....	
22, 000	22, 000	.00106	.00006	....	....	
23, 000	23, 000	.00112	.00006	....	....	
24, 000	24, 000	.00118	.00006	....	....	
25, 000	25, 000	.00124	.00004	.00012	.00006	
26, 000	26, 000	.00132	.00008	....	....	
27, 000	27, 000	.00138	.00006	....	....	
28, 000	28, 000	.00148	.00010	....	....	
29, 000	29, 000	.00158	.00010	....	....	
30, 000	30, 000	.00168	.00010	.00030	.00018	
31, 000	31, 000	.00180	.00012	....	....	
32, 000	32, 000	.00190	.00010	....	....	
33, 000	33, 000	.00202	.00012	....	....	
34, 000	34, 000	.00224	.00022	....	....	
35, 000	35, 000	.00250	.00026	.00086	.00056	
36, 000	36, 000	.00272	.00022	....	....	
37 000	37, 000	.00296	.00024	....	....	
38, 000	38, 000	.00322	.00026	....	....	
39, 000	39, 000	.00360	.00038	....	....	
40, 000	40, 000	.00412	.00052	.00224	.00138	
41, 000	41, 000	.00452	.00040	....	....	
42, 000	42, 000	.00490	.00038	....	....	
43, 000	43, 000	.00522	.00032	....	....	
44, 000	44, 000	.00590	.00068	....	....	
45, 000	45, 000	.00636	.00046	.00422	.00198	
46, 000	46, 000	.00682	.00046	....	....	
47, 000	47, 000	.00728	.00046	....	....	
48, 000	48, 000	.00772	.00044	....	....	
49, 000	49, 000	.00830	.00058	....	....	
50, 000	50, 000	.00892	.00062	.00652	.00230	
60, 050	60, 050	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 21.

No. 4683.

Marks, $\substack{12\ \mathrm{M\ R_{7}\ T\ R_{2}} \\ \mathrm{B\ T_{1}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	**Initial load.**
2,000	2,000	.000065	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000155	.000050	....	....	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000270	.000060	....	....	
7,000	7,000	.000330	.000060	....	....	
8,000	8,000	.000380	.000050	....	....	
9,000	9,000	.000435	.000055	....	....	
10.000	10,000	.000490	.000055	.000030	.000025	
11,000	11,000	.000545	.000055	....	....	
12,000	12,000	.000615	.000070	.000040	.000010	
13.000	13,000	.000680	.000065	....	....	
14,000	14,000	.000740	.000060	.000075	.000035	
15,000	15,000	.000835	.000095	....	....	
16,000	16,000	.000910	.000075	.000105	.000030	
17.000	17,000	.001000	.000090	....	....	
18.000	18,000	.001090	.000090	.000180	.000075	
19,000	19,000	.001200	.000110	....	....	
20,000	20,000	.001335	.000135	.000285	.000105	
21,000	21,000	.001470	.000135	....	....	
22.000	22.000	.001635	.000165	.000435	.000150	
23,000	23,000	.001880	.000245	....	....	
24.000	24,000	.002110	.000230	.000770	.000335	
25.000	25,000	.002435	.000325	.001020	.000250	
28,640	28,640	....	....	....	....	**Tensile strength.**

Fractured 8″.6 from neck. Appearance, granular.

No. 4684.

Marks, $\genfrac{}{}{0pt}{}{12\,M\,R_{11}\,T\,R_1}{M\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000110	.000055	....	....	
4,000	4,000	.000160	.000050	....	....	
5,000	5,000	.000220	.000060	.000010	.000010	
6,000	6,000	.000275	.000055	....	....	
7,000	7,000	.000330	.000055	....	....	
8,000	8,000	.000390	.000060	....	....	
9,000	9,000	.000450	.000060	....	....	
10,000	10,000	.000505	.000055	.000040	.000030	
11,000	11,000	.000560	.000055	....	....	
12,000	12,000	.000625	.000065	.000050	.000010	
13,000	13,000	.000690	.000065	....	....	
14,000	14,000	.000755	.000065	.000075	.000025	
15,000	15,000	.000840	.000085	....	....	
16,000	16,000	.000910	.000070	.000105	.000030	
17,000	17,000	.000995	.000085	....	....	
18,000	18,000	.001100	.000105	.000165	.000060	
19,000	19,000	.001200	.000100	....	....	
20,000	20,000	.001300	.000100	.000250	.000085	
21,000	21,000	.001450	.000150	....	....	
22,000	22,000	.001600	.000150	.000410	.000160	
23,000	23,000	.001800	.000200	....	....	
24,000	24,000	.002010	.000210	.000670	.000260	
25,000	25,000	.002340	.000330	.000900	.000230	
29,140	29,140	....	....	....	....	Tensile strength.

Fractured 2″.6 from neck. Appearance, granular.

No. 1051.

Marks, $^{12\,\text{M B}_{\text{II}}\ \text{T B}_2}_{\text{B T}_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00028	.00008	....	....	
7,000	7,000	.00032	.00004	....	....	
8,000	8,000	.00036	.00004	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00046	.00004	.00004	.00002	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00062	.00004	....	....	
14,000	14,000	.00070	.00008	....	....	
15,000	15,000	.00074	.00004	.00008	.00004	
16,000	16,000	.00082	.00008	....	....	
17,000	17,000	.00088	.00006	....	....	
18,000	18,000	.00092	.00004	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00106	.00008	.00014	.00006	
21,000	21,000	.00112	.00006	....	....	
22,000	22,000	.00120	.00008	....	....	
23,000	23,000	.00128	.00008	....	....	
24,000	24,000	.00136	.00008	....	....	
25,000	25,000	.00144	.00008	.00028	.00014	
26,000	26,000	.00152	.00008	....	....	
27,000	27,000	.00162	.00010	....	....	
28,000	28,000	.00170	.00008	....	....	
29,000	29,000	.00184	.00014	....	....	
30,000	30,000	.00198	.00014	.00058	.00030	
31,000	31 000	.00218	.00020	....	....	
32,000	32,000	.00232	.00014	....	....	
33,000	33,000	.00260	.00028	....	....	
34,000	34,000	.00290	.00030	....	....	
35,000	35,000	.00330	.00040	.00162	.00108	
36,000	36,000	.00366	.00036	....	....	
37,000	37,000	.00392	.00026	....	....	
38,000	38,000	.00440	.00048	....	....	
39,000	39,000	.00486	.00046	....	....	
40,000	40,000	.00530	.00044	.00334	.00172	
41,000	41,000	.00598	.00068	....	....	
42,000	42,000	.00644	.00046	....	....	
43,000	43,000	.00700	.00056	....	....	
44,000	44,000	.00762	.00062	....	....	
45,000	45,000	.00820	.00058	.00594	.00260	
46,000	46,000	.00880	.00060	....	....	
47,000	47,000	.00912	.00032	....	....	
48,000	48,000	.00962	.00050	....	....	
49,000	49,000	.01016	.00054	....	....	
50,000	50,000	.01052	.00036	.00806	.00212	
60,200	60,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1052.

Marks, $\begin{array}{c}\mathrm{12\,M\,R_{21}\;T\,R_{8}}\\ \mathrm{B\,R_{10}}\end{array}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	...	...	
3,000	3,000	.00008	.00004	...	...	
4,000	4,000	.00012	.00004	...	...	
5,000	5,000	.00018	.00006	0.	...	
6,000	6,000	.00022	.00004	...	...	
7,000	7,000	.00028	.00006	...	...	
8,000	8,000	.00032	.00004	...	...	
9,000	9,000	.00036	.00004	...	...	
10,000	10,000	.00042	.00006	.00004	.00004	
11,000	11,000	.00048	.00006	...	...	
12,000	12,000	.00054	.00006	...	...	
13,000	13,000	.00060	.00006	...	...	
14,000	14,000	.00066	.00006	...	...	
15,000	15,000	.00070	.00004	.00008	.00004	
16,000	16,000	.00076	.00006	...	...	
17,000	17,000	.00082	.00006	...	...	
18,000	18,000	.00088	.00006	...	...	
19,000	19,000	.00094	.00006	...	...	
20,000	20,000	.00102	.00008	.00012	.00004	
21,000	21,000	.00108	.00006	...	...	
22,000	22,000	.00114	.00006	...	...	
23,000	23,000	.00120	.00006	...	...	
24,000	24,000	.00130	.00010	...	...	
25,000	25,000	.00140	.00010	.00026	.00014	
26,000	26,000	.00148	.00008	...	...	
27,000	27,000	.00158	.00010	...	...	
28,000	28,000	.00168	.00010	...	...	
29,000	29,000	.00180	.00012	...	...	
30,000	30,000	.00198	.00018	.00060	.00034	
31,000	31,000	.00218	.00020	...	...	
32,000	32,000	.00240	.00022	...	...	
33,000	33,000	.00260	.00020	...	...	
34,000	34,000	.00288	.00028	...	...	
35,000	35,000	.00320	.00032	.00154	.00094	
36,000	36,000	.00368	.00048	...	...	
37,000	37,000	.00410	.00042	...	...	
38,000	38,000	.00452	.00042	...	...	
39,000	39,000	.00500	.00048	...	...	
40,000	40,000	.00554	.00054	.00360	.00206	
41,000	41,000	.00602	.00048	...	...	
42,000	42,000	.00638	.00036	...	...	
43,000	43,000	.00700	.00062	...	...	
44,000	44,000	.00750	.00050	...	...	
45,000	45,000	.00810	.00060	.00590	.00230	
46,000	46,000	.00858	.00048	...	...	
47,000	47,000	.00900	.00042	...	...	
48,000	48,000	.00950	.00050	...	...	
49,000	49,000	.00986	.00036	...	...	
50,000	50,000	.01016	.00030	.00780	.00190	
59,580	59,580	...	...	...	...	Ultimate strength.

Failed by triple flexure.

No. 1053.

Marks, $^{12\,\text{M R}_{\text{II}}\,\text{T R}_1}_{\text{M T}_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00022	.00006	.00004	.00004	
6,000	6,000	.00028	.00006	....	....	
7,000	7,000	.00032	.00004	....	....	
8,000	8,000	.00038	.00006	....	....	
9,000	9,000	.00044	.00006	....	....	
10,000	10,000	.00050	.00006	.00008	.00004	
11,000	11,000	.00058	.00008	....	....	
12,000	12,000	.00062	.00004	....	....	
13,000	13,000	.00068	.00006	....	....	
14,000	14,000	.00072	.00004	....	....	
15,000	15,000	.00078	.00006	.00014	.00006	
16,000	16,000	.00086	.00008	....	....	
17,000	17,000	.00092	.00006	....	....	
18,000	18,000	.00100	.00008	....	....	
19,000	19,000	.00106	.00006	....	....	
20,000	20,000	.00110	.00006	.00020	.00006	
21,000	21,000	.00120	.00010	....	....	
22,000	22,000	.00126	.00006	....	....	
23,000	23,000	.00132	.00006	....	....	
24,000	24,000	.00140	.00008	....	....	
25,000	25,000	.00150	.00010	.00034	.00014	
26,000	26,000	.00162	.00012	....	....	
27,000	27,000	.00170	.00008	....	....	
28,000	28,000	.00182	.00012	....	....	
29,000	29,000	.00194	.00012	....	....	
30,000	30,000	.00210	.00016	.00068	.00034	
31,000	31,000	.00230	.00020	....	....	
32,000	32,000	.00252	.00022	....	....	
33,000	33,000	.00278	.00026	....	....	
34,000	34,000	.00306	.00028	....	....	
35,000	35,000	.00340	.00034	.00172	.00104	
36,000	36,000	.00380	.00040	....	....	
37,000	37,000	.00418	.00038	....	....	
38,000	38,000	.00468	.00050	....	....	
39,000	39,000	.00520	.00052	....	....	
40,000	40,000	.00562	.00042	.00366	.00194	
41,000	41,000	.00610	.00048	....	....	
42,000	42,000	.00660	.00050	....	....	
43,000	43,000	.00702	.00042	....	....	
44,000	44,000	.00750	.00048	....	....	
45,000	45,000	.00802	.00052	.00582	.00216	
46,000	46,000	.00840	.00038	....	....	
47,000	47,000	.00872	.00032	....	....	
48,000	48,000	.00900	.00028	....	....	
49,000	49,000	.00922	.00022	....	....	
50,000	50,000	.00946	.00024	.00720	.00138	
57,490	57,490	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 21.

EXTRA MUZZLE DISK.

No. 4609.

Marks, $\overset{12\,M\,R_{21}\,T\,R_3}{M\,T}$,
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	*Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4.000	.000155	.000050	....	....	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	000260	.000050	....	....	
7,000	7,000	.000320	.000060	....	....	
8,000	8,000	.000385	.000065	....	....	
9,000	9,000	.000445	.000060	....	....	
10,000	10,000	.000500	.000055	.000015	.000040	
11,000	11,000	.000560	.000060	....	....	
12,000	12,000	.000625	.000065	.000050	.000005	
13,000	13,000	.000700	.000075	....	....	
14,000	14,000	.000765	.000065	.000090	.000040	
15,000	15,000	.000850	.000085	....	....	
16,000	16,000	.000925	.000075	.000120	.000030	
17,000	17,000	.001015	.000090	....	....	
18,000	18,000	.001105	.000090	.000195	.000075	
19,000	19,000	.001225	.000120	....	....	
20,000	20,000	.001350	.000125	.000285	.000090	
21,000	21,000	.001510	.000160	....	....	
22,000	22,000	.001660	.000150	.000460	.000175	
23,000	23,000	.001855	.000195	....	....	
24,000	24,000	.002090	.000235	.000750	.000290	
25,000	25,000	.002425	.000335	.001000	.000250	
27,870	27,870	....	....	....	....	Tensile strength.

Fractured 9″.1 from neck. Appearance, granular.

No. 1069.

Marks, $\substack{12\ M\ R_{21}\ T\ R_{8} \\ M\ T_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00050	.00008	0.	....	
11,000	11,000	.00054	.00004	....	....	
12,000	12,000	.00060	.00006	....	....	
13,000	13,000	.00066	.00006	....	....	
14,000	14,000	.00072	.00006	....	....	
15,000	15,000	.00078	.00006	.00002	.00002	
16,000	16,000	.00082	.00004	....	....	
17,000	17,000	.00090	.00008	....	....	
18,000	18,000	.00096	.00006	....	....	
19,000	19,000	.00102	.00006	....	....	
20,000	20,000	.00108	.00006	.00010	.00008	
21,000	21,000	.00114	.00006	....	....	
22,000	22,000	.00122	.00008	....	....	
23,000	23,000	.00130	.00008	....	....	
24,000	24,000	.00138	.00008	....	....	
25 000	25,000	.00148	.00010	.00022	.00012	
26,000	26,000	.00158	.00010	....	....	
27,000	27,000	.00168	.00010	....	....	
28,000	28,000	.00178	.00010	....	....	
29,000	29,000	.90192	.00014	....	....	
30,000	30,000	.00210	.00018	.00060	.00038	
31,000	31,000	.00230	.00020	....	....	
32,000	32,000	.00256	.00026	....	....	
33,000	33,000	.00278	.00022	....	....	
34,000	34,000	.00310	.00032	....	....	
35,000	35,000	.00350	.00040	.00174	.00114	
36,000	36,000	.00394	.00044	....	....	
37,000	37,000	.00438	.00044	....	....	
38,000	38,000	.00490	.00052	....	....	
39,000	39,000	.00548	.00058	....	....	
40 000	40,000	.00594	.00046	.00394	.00220	
41,000	41,000	.00646	.00052	....	....	
42,000	42,000	.00710	.00064	....	....	
43,000	43,000	.00760	.00050	....	....	
44,000	44,000	.00826	.00066	....	....	
45,000	45,000	.00880	.00054	.00646	.00252	
46,000	46,000	.00942	.00062	....	....	
47,000	47,000	.01004	.00062	....	....	
48,000	48,000	.01070	.00066	....	....	
49,000	49,000	.01174	.00104	....	....	
50,000	50,000	.01228	.00054	.00968	.00322	
57,590	57,590	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY No. 21 (second casting).

No. 4749.

Marks, $^{12\,M\,R_{T_1}\,T\,R_2}_{\quad B\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	....	....	
3,000	3,000	.000095	.000050	....	....	
4,000	4,000	.000145	.000050	....	....	
5,000	5,009	.000195	.000050	0.	....	
6,000	6,000	.000250	.000055	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000355	.000055	....	....	
9,000	9,000	.000425	.000070	....	....	
10,000	10,000	.000490	.000065	.000025	.000025	
11,000	11,000	.000550	.000060	....	....	
12,000	12,000	.000610	.000060	.000050	.000025	
13,000	13,000	.000690	.000080	....	....	
14,000	14,000	.000760	.000070	.000085	.000035	
15,000	15,000	.000850	.000090	....	....	
16,000	16,000	.000940	.000090	.000120	.000035	
17,000	17,000	.001040	.000100	....	....	
18,000	18,000	.001125	.000085	.000190	.000070	
19,000	19,000	.001250	.000125	....	....	
20,000	20,000	.001375	.000125	.000300	.000110	
21,000	21,000	.001550	.000175	....	....	
22,000	22,000	.001700	.000150	.000485	.000185	
23,000	23,000	.001945	.000245	....	....	
24,000	24,000	.002200	.000255	.000815	.000330	
25,000	25,000	.002600	.000400	.001110	.000295	
25,320	25,320	....	....	....	....	Tensile strength.

Fractured 5″.8 from neck. Appearance, granular.

No. 4750.

Marks, $\frac{12\,M\,R_{11}\,T\,R_1}{M\,T_{11}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000095	.000045	....	....	
4,000	4,000	.000140	.000045	....	....	
5,000	5,000	.000180	.000040	0.	....	
6,000	6,000	.000230	.000050	....	....	
7,000	7,000	.000280	.000050	....	....	
8,000	8,000	.000335	.000055	....	....	
9,000	9,000	.000385	.000050	....	....	
10,000	10,000	.000440	.000055	0.	....	
11,000	11,000	.000495	.000055	....	....	
12,000	12,000	.000545	.000050	.000015	.000015	
13,000	13,000	.000605	.000060	....	....	
14,000	14,000	.000660	.000055	.000040	.000025	
15,000	15,000	.000740	.000080	....	....	
16,000	16,000	.000800	.000060	.000055	.000015	
17,000	17,000	.000860	.000060	....	....	
18,000	18,000	.000915	.000085	.000095	.000040	
19,000	19,000	.001015	.000070	....	....	
20,000	20,000	.001100	.000085	.000145	.000050	
21,000	21,000	.001200	.000100	....	....	
22,000	22,000	.001285	.000085	.000205	.000060	
23,000	23,000	.001405	.000120	....	....	
24,000	24,000	.001515	.000110	.000325	.000120	
25,000	25,000	.001690	.000175	.000430	.000105	
28,650	28,650	....	....	....	....	Tensile strength.

Fractured ''.3 from neck. Appearance, granular.

No. 1082.

Marks, $^{12}\,\underset{\mathrm{B\,T_{11}}}{\mathrm{M\,R_{11}\,T\,R_{1}}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00014	.00006			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00028	.00004			
8,000	8,000	.00032	.00004			
9,000	9,000	.00036	.00004			
10,000	10,000	.00044	.00008	.00002	.00002	
11,000	11,000	.00048	.00004			
12,000	12,000	.00054	.00006			
13,000	13,000	.00058	.00004			
14,000	14,000	.00064	.00006			
15,000	15,000	.00072	.00008	.00004	.00002	
16,000	16,000	.00076	.00004			
17,000	17,000	.00082	.00006			
18,000	18,000	.00088	.00006			
19,000	19,000	.00094	.00006			
20,000	20,000	.00100	.00006	.00008	.00004	
21,000	21,000	.00106	.00006			
22,000	22,000	.00114	.00008			
23,000	23,000	.00122	.00008			
24,000	24,000	.00128	.00006			
25,000	25,000	.00136	.00008	.00018	.00010	
26,000	26,000	.00146	.00010			
27,000	27,000	.00154	.00008			
28,000	28,000	.00164	.00010			
29,000	29,000	.00174	.00010			
30,000	30,000	.00186	.00012	.00044	.00006	
31,000	31,000	.00200	.00014			
32,000	32,000	.00212	.00012			
33,000	33,000	.00232	.00020			
34,000	34,000	.00258	.00026			
35,000	35,000	.00286	.00028	.00116	.00072	
36,000	36,000	.00306	.00020			
37,000	37,000	.00328	.00022			
38,000	38,000	.00360	.00032			
39,000	39,000	.00404	.00044			
40,000	40,000	.00450	.00046	.00256	.00140	
41,000	41,000	.00518	.00068			
42,000	42,000	.00558	.00040			
43,000	43,000	.00590	.00032			
44,000	44,000	.00652	.00062			
45,000	45,000	.00710	.00058	.00486	.00230	
46,000	46,000	.00732	.00022			
47,000	47,000	.00820	.00088			
48,000	48,000	.00860	.00040			
49,000	49,000	.00932	.00072			
50,000	50,000	.00980	.00048	.00726	.00340	
61,700	61,700					Ultimate strength.

Failed by triple flexure,

No. 1083.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{11}\,\mathrm{T}\,\mathrm{R}_{3}}_{\mathrm{B}\,\mathrm{R}_{26}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00022	.00004			
7,000	7,000	.00026	.00004			
8,000	8,000	.00030	.00004			
9,000	9,000	.00036	.00006			
10,000	10,000	.00042	.00006	0.		
11,000	11,000	.00048	.00006			
12,000	12,000	.00052	.00004			
13,000	13,000	.00060	.00008			
14,000	14,000	.00066	.00006			
15,000	15,000	.00070	.00004	.00002	.00002	
16,000	16,000	.00076	.00006			
17,000	17,000	.00082	.00006			
18,000	18,000	.00088	.00006			
19,000	19,000	.00094	.00006			
20,000	20,000	.00100	.00006	.00010	.00008	
21,000	21,000	.00106	.00006			
22,000	22,000	.00112	.00006			
23,000	23,000	.00120	.00008			
24,000	24,000	.00128	.00008			
25,000	25,000	.00136	.00008	.00020	.00010	
26,000	26,000	.00142	.00006			
27,000	27,000	.00152	.00010			
28,000	28,000	.00162	.00010			
29,000	29,000	.00172	.00010			
30,000	30,000	.00186	.00014	.00046	.00028	
31,000	31,000	.00208	.00022			
32,000	32,000	.00224	.00016			
33,000	33,000	.00240	.00016			
34,000	34,000	.00260	.00020			
35,000	35,000	.00300	.00040	.00130	.00084	
36,000	36,000	.00336	.00036			
37,000	37,000	.00366	.00030			
38,000	38,000	.00404	.00038			
39,000	39,000	.00450	.00046			
40,000	40,000	.00490	.00040	.00292	.00162	
41,000	41,000	.00530	.00040			
42,000	42,000	.00580	.00050			
43,000	43,000	.00630	.00050			
44,000	44,000	.00690	.00060			
45,000	45,000	.00740	.00050	.00516	.00224	
46,000	46,000	.00794	.00054			
47,000	47,000	.00850	.00056			
48,000	48,000	.00884	.00034			
49,000	49,000	.00936	.00052			
50,000	50,000	.00982	.00046	.00738	.00222	
60,880	60,880					Ultimate strength.

Failed by triple flexure.

No. 1084.

Marks, $\substack{12\text{ M R}_{11}\text{ T R}_1 \\ \text{M T}_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	00004	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9.000	.00036	.00006	....	....	
10,000	10,000	.00040	.00004	0.	....	
11,000	11,000	.00046	.00006	....	....	
12,000	12,000	.00050	.00004	....	....	
13.000	13,000	.00056	.00006	....	....	
14,000	14,000	00062	.00006	....	....	
15,000	15,000	.00068	.00006	.00002	.00002	
16,000	16,000	.00072	.00004	....	....	
17,000	17,000	.00078	.00006	....	....	
18,000	18,000	.00086	.00008	....	....	
19,000	19,000	.00090	.00004	....	....	
20,000	20,000	.00096	.00006	.00008	.00006	
21,000	21,000	.00104	.00008	....	....	
22,000	22,000	.00110	.00006	....	....	
23,000	23,000	.00116	.00006	....	....	
24,000	24,000	.00122	.00006	....	....	
25,000	25.000	.00130	00008	.00018	.00010	
26,000	26,000	.00140	.00010	....	....	
27,000	27,000	.00148	.00008	....	....	
28,000	28,000	.00158	.00010	....	....	
29,000	29,000	.00168	.00010	....	....	
30,000	30,000	.00178	.00010	.00038	.00020	
31,000	31,000	.00192	.00014	....	....	
32,000	32,000	.00202	.00010	....	....	
33,000	33,000	.00220	.00018	....	....	
34,000	34,000	.00240	.00020	....	....	
35,000	35,000	.00262	.00022	00096	.00058	
36,000	36,000	.00292	.00030	....	....	
37,000	37,000	.00326	.00034	....	....	
38,000	38,000	.00360	.00034	....	....	
39,000	39,000	.00410	.00050	....	....	
40,000	40,000	.00460	.00050	.00262	.00166	
41,000	41,000	.00528	.00068	....	....	
42,000	42,000	.00572	.00044	....	....	
43,000	43,000	.00630	.00058	....	....	
44.000	44,000	.00698	.00068	....	....	
45,000	45,000	.00772	.00074	.00542	.00280	
46,000	46,000	.00854	.00082	....	....	
47,000	47,000	.00922	.00068	....	....	
48,000	48,000	.01030	.00108	....	....	
49,000	49,000	.01140	.00120	....	....	
50,000	50,000	.01280	.00140	.00996	.00454	
59,440	59,440	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 22.

No. 4688.

Marks, $^{12}\text{M}\,\underset{\text{B T}_1}{\text{R}_2}\,\text{T R}_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	....	....	
3,000	3,000	.000110	.000050	....	....	
4,000	4,000	.000165	.000055	....	....	
5,000	5,000	.000225	.000060	.000010	.000010	
6,000	6,000	.000280	.000055	....	....	
7,000	7,000	.000335	.000055	....	....	
8,000	8,000	.000395	.000060	....	....	
9,000	9,000	.000460	.000065	....	....	
10,000	10,000	.000515	.000055	.000025	.000015	
11,000	11,000	.000580	.000065	....	....	
12,000	12,000	.000645	.000065	.000050	.000025	
13,000	13,000	.000720	.000075	....	....	
14,000	14,000	.000795	.000075	.000075	.000025	
15,000	15,000	.000870	.000075	....	....	
16,000	16,000	.000960	.000090	.000130	.000055	
17,000	17,000	.001055	.000095	....	....	
18,000	18,000	.001165	.000110	.000200	.000070	
19,000	19,000	.001280	.000115	....	....	
20,000	20,000	.001425	.000145	.000325	.000125	
21,000	21,000	.001580	.000155	....	....	
22,000	22,000	.001790	.000210	.000545	.000220	
23,000	23,000	.002000	.000210	....	....	
24,000	24,000	.002300	.000300	.000910	.000365	
25,000	25,000	.002700	.000400	.001225	.000315	
27,690	27,690	....	....	....	....	Tensile strength.

Fractured 11″.4 from neck. Appearance, granular.

No. 4689.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{\mathrm{R}}\,\mathrm{T}\,\mathrm{R}_1}_{\mathrm{M}\,\mathrm{T}_1}$,
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000155	.000055	....	....	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000255	.000050	....	....	
7,000	7,000	.000305	.000050	....	....	
8,000	8,000	.000355	.000050	....	....	
9,000	9,000	.000415	.000060	....	....	
10,000	10,000	.000470	.000055	.000015	.000010	
11,000	11,000	.000540	.000070	....	....	
12,000	12,000	.000595	.000055	.000045	.000030	
13,000	13,000	.000660	.000065	....	....	
14,000	14,000	.000720	.000060	.000060	.000015	
15,000	15,000	.000790	.000070	....	....	
16,000	16,000	.000855	.000065	.000100	.000040	
17,000	17,000	.000945	.000090	....	....	
18,000	18,000	.001015	.000070	.000145	.000045	
19,000	19,000	.001105	.000090	....	....	
20,000	20,000	.001200	.000095	.000210	.000065	
21,000	21,000	.001310	.000110	....	....	
22,000	22,000	.001450	.000140	.000330	.000120	
23,000	23,000	.001595	.000145	....	....	
24,000	24,000	.001760	.000165	.000510	.000180	
25,000	25,000	.001975	.000215	.000670	.000160	
28,720	28,720	....	....	....	....	Tensile strength.

Fractured ″.5 from neck. Appearance, granular.

No. 1054.

Marks, $^{12\ \mathrm{M}\ \mathrm{R}_{12}\ \mathrm{T}\ \mathrm{R}_2}_{\qquad\ \mathrm{B}\ \mathrm{T}_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00038	.00006	....	....	
9,000	9,000	.00046	.00008	....	....	
10,000	10,000	.00052	.00006	.00002	.00002	
11,000	11,000	.00058	.00006	....	....	
12,000	12,000	.00064	.00006	....	....	
13,000	13,000	.00070	.00006	....	....	
14,000	14,000	.00076	.00006	....	....	
15,000	15,000	.00082	.00006	.00006	.00004	
16,000	16,000	.00088	.00006	....	....	
17,000	17,000	.00094	.00006	....	....	
18,000	18,000	.00100	.00006	....	....	
19,000	19,000	.00106	.00006	....	....	
20,000	20,000	.00114	.00008	.00014	.00008	
21,000	21,000	.00122	.00008	....	....	
22,000	22,000	.00128	.00006	....	....	
23,000	23,000	.00136	.00008	....	....	
24,000	24,000	.00146	.00010	....	....	
25,000	25,000	.00156	.00010	.00028	.00014	
26,000	26,000	.00170	.00014	....	....	
27,000	27,000	.00184	.00014	....	....	
28,000	28,000	.00196	.00012	....	....	
29,000	29,000	.00216	.00020	....	....	
30,000	30,000	.00236	.00020	.00082	.00054	
31,000	31,000	.00256	.00020	....	....	
32,000	32,000	.00290	.00034	....	....	
33,000	33,000	.00314	.00024	....	....	
34,000	34,000	.00354	.00040	....	....	
35,000	35,000	.00402	.00048	.00220	.00138	
36,000	36,000	.00434	.00032	....	....	
37,000	37,000	.00472	.00038	....	....	
38,000	38,000	.00530	.00058	....	....	
39,000	39,000	.00584	.00054	....	....	
40,000	40,000	.00632	.00048	.00424	.00204	
41,000	41,000	.00684	.00052	....	....	
42,000	42,000	.00738	.00054	....	....	
43,000	43,000	.00800	.00062	....	....	
44,000	44,000	.00850	.00050	....	....	
45,000	45,000	.00912	.00062	.00674	.00250	
46,000	46,000	.00950	.00038	....	....	
47,000	47,000	.00994	.00044	....	....	
48,000	48,000	.01034	.00040	....	....	
49,000	49,000	.01070	.00036	....	....	
50,000	50,000	.01106	.00036	.00854	.00180	
58,100	58,100	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1055.

Marks, $12\ M\ R_{7},\ T\ R,\ B\ R_{10}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00016	.00006	....	....	
5,000	5,000	.00024	.00008	.00002	.00002	
6,000	6,000	.00030	.00006	....	....	
7,000	7,000	.00034	.00004	....	....	
8,000	8,000	.00042	.00008	....	....	
9,000	9,000	.00048	.00006	....	....	
10,000	10,000	.00052	.00004	.00004	.00002	
11,000	11,000	.00058	.00006	....	....	
12.000	12,000	.00064	.00006	....	....	
13,000	13,000	.00070	.00006	....	....	
14,000	14,000	.00076	.00006	....	....	
15,000	15,000	.00080	.00004	.00008	.00004	
16,000	16,000	.00088	.00008	....	....	
17,000	17,000	.00094	.00006	....	....	
18,000	18,000	.00100	.00006	....	....	
19,000	19,000	.00106	.00006	....	....	
20,000	20,000	.00112	.00006	.00016	.00008	
21,000	21.000	.00120	.00008	....	....	
22,000	22,000	.00128	.00008	....	....	
23,000	23,000	.00134	.00006	....	....	
24,000	24,000	.00142	.00008	....	....	
25,000	25,000	.00152	.00010	.00030	.00014	
26,000	26,000	.00166	.00014	....	....	
27,000	27,000	.00178	.00012	....	....	
28,000	28.000	.00188	.00010	....	....	
29,000	29.000	.00198	.00010	....	....	
30,000	30,000	.00220	.00022	.00068	.00038	
31,000	31,000	.00248	.00028	....	....	
32,000	32,000	.00276	.00028	....	....	
33,000	33,000	.00310	.00034	....	....	
34,000	34,000	.00352	.00042	....	....	
35,000	35,000	.00402	.00050	.00224	.00156	
36,000	36,000	.00442	.00040	....	....	
37,000	37,000	.00490	.00048	....	....	
38,000	38,000	.00532	.00042	....	....	
39,000	39,000	.00602	.00070	....	....	
40,000	40,000	.00662	.00060	.00456	.00232	
41,000	41,000	.00710	.00048	....	....	
42,000	42,000	.00756	.00046	....	....	
43,000	43,000	.00824	.00068	....	....	
44,000	44,000	.00894	.00070	....	....	
45,000	45,000	.00972	.00078	.00734	.00278	
46,000	46,000	.01020	.00048	....	....	
47,000	47,000	.01068	.00048	....	....	
48,000	48,000	.01142	.00074	....	....	
49,000	49,000	.01214	.00072	....	....	
50,000	50,000	.01310	.00096	.01040	.00306	
57,980	57,980	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1056.

Marks, $^{12\text{ M R}_{8}\text{ T R}_{6}}_{\text{M T}_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00040	.00008	....	....	
9,000	9,000	.00044	.00004	....	....	
10,000	10,000	.00050	.00006	.00002	.00002	
11,000	11,000	.00056	.00006	....	....	
12,000	12,000	.00062	.00006	....	....	
13,000	13,000	.00068	.00006	....	....	
14,000	14,000	.00072	.00004	....	....	
15,000	15,000	.00078	.00006	.00006	.00004	
16,000	16,000	.00084	.00006	....	....	
17,000	17,000	.00090	.00006	....	....	
18,000	18,000	.00096	.00006	....	....	
19,000	19,000	.00102	.00006	....	....	
20,000	20,000	.00108	.00006	.00012	.00006	
21,000	21,000	.00116	.00008	....	....	
22,000	22,000	.00124	.00008	....	....	
23,000	23,000	.00130	.00006	....	....	
24,000	24,000	.00140	.00010	....	....	
25,000	25,000	.00148	.00008	.00028	.00016	
26,000	26,000	.00158	.00010	....	....	
27,000	27,000	.00168	.00010	....	....	
28,000	28,000	.00180	.00012	....	....	
29,000	29,000	.00192	.00012	....	....	
30,000	30,000	.00210	.00018	.00066	.00038	
31,000	31,000	.00236	.00026	....	....	
32,000	32,000	.00258	.00022	....	....	
33,000	33,000	.00290	.00032	....	....	
34,000	34,000	.00316	.00026	....	....	
35,000	35,000	.00352	.00036	.00180	.00114	
36,000	36,000	.00386	.00034	....	....	
37,000	37,000	.00422	.00036	....	....	
38,000	38,000	.00464	.00042	....	....	
39,000	39,000	.00514	.00050	....	....	
40,000	40,000	.00560	.00046	.00366	.00186	
41,000	41,000	.00600	.00040	....	....	
42,000	42,000	.00628	.00028	....	....	
43,000	43,000	.00660	.00032	....	....	
44,000	44,000	.00690	.00030	....	....	
45,000	45,000	.00716	.00026	.00506	.00140	
46,000	46,000	.00734	.00018	....	....	
47,000	47,000	.00744	.00010	....	....	
48,000	48,000	.00748	.00004	....	....	Deflects; convex on the micrometer side.
49,000	49,000	.00760	.00012	....	....	
50,000	50,000	.00768	.00008	.00562	.00056	
54,910	54,910	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 22 (second casting).

No. 4753.

Marks, $\begin{matrix}{}^{12}\mathrm{M\,R_2\,T\,R_2}\\ \mathrm{B\,T_{11}}\end{matrix}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000155	.000050	....	....	
5,000	5,000	.000210	.000055	.000005	.000005	
6,000	6,000	.000265	.000055	....	....	
7,000	7,000	.000315	.000050	....	....	
8,000	8,000	.000365	.000050	....	....	
9,000	9,000	.000430	.000065	....	....	
10,000	10,000	.000495	.000065	.000035	.000030	
11.000	11,000	.000550	.000055	....	....	
12,000	12,000	.000610	.000060	.000050	.000015	
13,000	13,000	.000690	.000080	....	....	
14,000	14,000	.000760	.000070	.000070	.000020	
15,000	15,000	.000845	.000085	....	....	
16,000	16,000	.000940	.000095	.000110	.000040	
17,000	17,000	.001010	.000070	....	....	
18,000	18,000	.001100	.000090	.000175	.000065	
19,000	19,000	.001205	.000105	....	....	
20,000	20,000	.001335	.000130	.000260	.000085	
21,000	21,000	.001480	.000145	....	....	
22,000	22,000	.001640	.000160	.000415	.000155	
23,000	23,000	.001880	.000240	....	....	
24,000	24,000	.002100	.000220	....	....	Tensile strength.

Fractured 5''.9 from neck. Appearance, granular, with coarse spangles.

No. 4754.

Marks, $\overset{12\,\mathrm{M\,R_{R}\,T\,R_{1}}}{\mathrm{M\,T_{11}}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000245	.000045	....	....	
7,000	7,000	.000295	.000050	....	....	
8,000	8,000	.000345	.000050	....	....	
9,000	9,000	.000395	.000050	....	....	
10,000	10,000	.000450	.000055	.000010	.000010	
11,000	11,000	.000500	.000050	....	....	
12,000	12,000	.000560	.000060	.000030	.000020	
13,000	13,000	.000615	.000055	....	....	
14,000	14,000	.000690	.000075	.000050	.000020	
15,000	15,000	.000750	.000060	....	....	
16,000	16,000	.000810	.000060	.000070	.000020	
17,000	17,000	.000925	.000115	....	....	
18,000	18,000	.000990	.000065	.000110	.000040	
19,000	19,000	.001045	.000055	....	....	
20,000	20,000	.001140	.000095	.000160	.000050	
21,000	21,000	.001240	.000100	....	....	
22,000	22,000	.001355	.000115	.000260	.000100	
23,000	23,000	.001500	.000145	....	....	
24,000	24,000	.001660	.000160	.000445	.000185	
25,000	25,000	.001900	.000240	.000600	.000155	
28,150	28,150	....	....	....	....	Tensile strength.

Fractured 1″.1 from neck. Appearance, granular.

No. 1085.

Marks, $12\ M\ R_{12}\ T\ R_{2}$ $B\ T_{12}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00024	.00004	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00040	.00006	....	....	
10,000	10,000	.00046	.00006	0.	....	
11,000	11,000	.00052	.00006	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00062	.00004	....	....	
14,000	14,000	.00068	.00006	....	....	
15,000	15,000	.00074	.00006	.00004	.00004	
16,000	16,000	.00078	.00004	....	....	
17,000	17,000	.00084	.00006	....	....	
18,000	18,000	.00090	.00006	....	....	
19,000	19,000	.00098	.00008	....	....	
20,000	20,000	.00104	.00006	.00010	.00006	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00116	.00006	....	....	
23,000	23,000	.00124	.00008	....	....	
24,000	24,000	.00130	.00006	....	....	
25,000	25,000	.00140	.00010	.00022	.00012	
26,000	26,000	.00148	.00008	....	....	
27,000	27,000	.00156	.00008	....	....	
28,000	28,000	.00168	.00012	....	....	
29,000	29,000	.00178	.00010	....	....	
30,000	30,000	.00194	.00016	.00050	.00028	
31,000	31,000	.00210	.00016	....	....	
32,000	32,000	.00226	.00016	....	....	
33,000	33,000	.00248	.00022	....	....	
34,000	34,000	.00266	.00018	....	....	
35,000	35,000	.00306	.00040	.00132	.00082	
36,000	36,000	.00330	.00024	....	....	
37,000	37,000	.00356	.00026	....	....	
38,000	38,000	.00400	.00044	....	....	
39,000	39,000	.00444	.00044	....	....	
40,000	40,000	.00494	.00050	.00296	.00164	
41,000	41,000	.00534	.00040	....	....	
42,000	42,000	.00586	.00052	....	....	
43,000	43,000	.00636	.00050	....	....	
44,000	44,000	.00676	.00040	....	....	
45,000	45,000	.00744	.00068	.00516	.00220	
46,000	46,000	.00790	.00046	....	....	
47,000	47,000	.00840	.00050	....	....	
48,000	48,000	.00876	.00036	....	....	
49,000	49,000	.00912	.00036	....	....	
50,000	50,000	.00950	.00038	.00704	.00188	
60,280	60,280	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1086.

Marks, $^{12\ \text{M R}_{7}\ \text{T R}_{3}}_{\text{B R}_{20}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00026	.00006	....	....	
7,000	7,000	.00030	.00004	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00040	.00004	....	....	
10,000	10,000	.00046	.00006	0.	....	
11,000	11,000	.00050	.00004	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00004	.00004	
16,000	16,000	.00076	.00004	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00090	.00008	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00100	.00004	.00010	.00006	
21,000	21,000	.00108	.00008	....	....	
22,000	22,000	.00114	.00006	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00128	.00006	....	....	
25,000	25,000	.00134	.00006	.00020	.00010	
26,000	26,000	.00144	.00010	....	....	
27,000	27,000	.00152	.00008	....	....	
28,000	28,000	.00162	.00010	....	....	
29,000	29,000	.00176	.00014	....	....	
30,000	30,000	.00190	.00014	.00048	.00028	
31,000	31,000	.00204	.00014	....	....	
32,000	32,000	.00222	.00018	....	....	
33,000	33,000	.00248	.00026	....	....	
34,000	34,000	.00272	.00024	....	....	
35,000	35,000	.00310	.00038	.00120	.00072	
36,000	36,000	.00342	.00032	....	....	
37,000	37,000	.00368	.00026	....	....	
38,000	38,000	.00422	.00054	....	....	
39,000	39,000	.00470	.00048	....	....	
40,000	40,000	.00514	.00044	.00318	.00198	
41,000	41,000	.00576	.00062	....	....	
42,000	42,000	.00632	.00056	....	....	
43,000	43,000	.00686	.00054	....	....	
44,000	44,000	.00744	.00058	....	....	
45,000	45,000	.00840	.00096	.00606	.00288	
46,000	46,000	.00886	.00046	....	....	
47,000	47,000	.00936	.00050	....	....	
48,000	48,000	.01016	.00080	....	....	
49,000	49,000	.01118	.00102	....	....	
50,000	50,000	.01222	.00104	.00950	.00344	
60,040	60,040	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1087.

Marks, $^{12\,M\,R_{II}\,T\,B_1}_{M\,T_{II}}$
Length, 10″.5.
Diameter 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00014	.00004			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00022	.00004			
7,000	7.000	.00028	.00006			
8,000	8,000	.00032	.00004			
9,000	9,000	.00038	.00006			
10,000	10,000	.00042	.00004	0.		
11,000	11,000	.00048	.00006			
12,000	12,000	.00054	.00006			
13,000	13,000	.00060	.00006			
14,000	14,000	.00064	.00004			
15,000	15,000	.00070	.00006	.00004	.00004	
16,000	16,000	00076	.00006			
17,000	17,000	.00082	.00006			
18,000	18,000	.00088	.00006			
19,000	19,000	.00094	.00006			
20,000	20,000	.00102	.00008	.00010	.00006	
21,000	21,000	00108	.00006			
22,000	22,000	.00114	.00006			
23,000	23,000	.00122	.00008			
24,000	24,000	.00130	.00008			
25,000	25,000	.00138	.00008	.00020	.00010	
26,000	26,000	.00150	.00012			
27,000	27,000	.00156	.00006			
28,000	28,000	.00164	.00008			
29,000	29,000	.00178	.00014			
30,000	30,000	.00194	.00016	.00052	.00032	
31,000	31,000	.00210	.00016			
32,000	32,000	.00228	.00018			
33,000	33,000	.00252	.00024			
34,000	34,000	00280	.00028			
35,000	35,000	.00310	.00030	.00146	.00094	
36,000	36,000	.00338	.00028			
37,000	37,000	.00380	.00042			
38,000	38,000	.00434	.00054			
39,000	39,000	.00476	.00042			
40,000	40,000	.00528	.00052	.00330	.00184	
41,000	41,000	.00572	.00044			
42,000	42,000	.00628	.00056			
43,000	43,000	.00686	.00058			
44,000	44,000	.00740	.00054			
45,000	45,000	.00810	.00070	.00582	.00252	
46,000	46,000	.00880	.00070			
47,000	47,000	.00930	.00050			
48,000	48,000	.00980	.00050			
49,000	49,000	01040	.00060			
50,000	50,000	.01124	.00084	.00866	.00284	
60,880	60,880					Ultimate strength.

Failed by triple flexure.

BODY NO. 23.

No. 4693.

Marks, $^{12\ M\ R_{2}\ T\ R_{1}}_{\qquad B\ T_{1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000305	.000055	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000420	.000060	....	....	
10,000	10,000	.000485	.000065	.000010	.000010	
11,000	11,000	.000550	.000065	....	....	
12,000	12,000	.000610	.000060	.000040	.000030	
13,000	13,000	.000690	.000080	....	....	
14,000	14,000	.000755	.000065	.000055	.000015	
15,000	15,000	.000850	.000095	....	....	
16,000	16,000	.000935	.000085	.000105	.000050	
17,000	17,000	.001040	.000105	....	....	
18,000	18,000	.001150	.000110	.000190	.000085	
19,000	19,000	.001265	.000115	....	....	
20,000	20,000	.001425	.000160	.000315	.000125	
21,000	21,000	.001575	.000150	....	....	
22,000	22,000	.001790	.000215	.000540	.000225	
23,000	23,000	.002125	.000335	....	....	
24,000	24,000	.002350	.000225	.000945	.000405	
25,000	25,000	.002715	.000365	.001240	.000295	
25,010	25,010	....	....	....	....	Tensile strength.

Fractured 4″.9 from neck. Appearance, granular.

No. 4694.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{31}\,\mathrm{T}\,\mathrm{R}_1}_{\mathrm{M}\,\mathrm{T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000255	.000055	....	....	
7,000	7,000	.000300	.000045	....	....	
8,000	8,000	.000355	.000055	....	....	
9,000	9,000	.000410	.000055	....	....	
10,000	10,000	.000460	.000050	.000010	.000010	
11,000	11,000	.000525	.000065	....	....	
12,000	12,000	.000590	.000065	.000030	.000020	
13,000	13,000	.000650	.000060	....	....	
14,000	14,000	.000710	.000060	.000050	.000020	
15,000	15,000	.000795	.000085	....	....	
16,000	16,000	.000855	.000060	.000090	.000040	
17,000	17,000	.000945	.000090	....	....	
18,000	18,000	.001025	.000080	.000140	.000050	
19,000	19,000	.001110	.000085	....	....	
20,000	20,000	.001225	.000115	.000200	.000060	
21,000	21,000	.001350	.000125	....	....	
22,000	22,000	.001470	.000120	.000320	.000120	
23,000	23,000	.001650	.000180	....	....	
24,000	24,000	.001800	.000150	.000505	.000185	
25,000	25,000	.002060	.000260	.000700	.000195	
28,020	28,020	....	....	....	....	Tensile strength.

Fractured 10″.6 from neck. Appearance, granular.

No. 1003.

Marks, $^{12}\mathrm{M}\,\underset{\mathrm{B}\ \mathrm{T}_2}{\mathrm{R}_{12}}\,\mathrm{T}\,\mathrm{R}_3$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00062	.00006	....	....	
14,000	14,000	.00070	.00008	....	....	
15,000	15,000	.00074	.00004	.00010	.00008	
16,000	16,000	.00082	.00008	....	....	
17,000	17,000	.00088	.00006	....	....	
18,000	18,000	.00094	.00006	....	....	
19,000	19,000	.00100	.00006	....	....	
20,000	20,000	.00106	.00006	.00016	.00006	
21,000	21,000	.00112	.00006	....	....	
22,000	22,000	.00120	.00008	....	....	
23,000	23,000	.00128	.00008	....	....	
24,000	24,000	.00134	.00006	....	....	
25,000	25,000	.00142	.00008	.00030	.00014	
26,000	26,000	.00152	.00010	....	....	
27,000	27,000	.00160	.00008	....	....	
28,000	28,000	.00170	.00010	....	....	
29,000	29,000	.00182	.00012	....	....	
30,000	30,000	.00196	.00014	.00054	.00024	
31,000	31,000	.00214	.00018	....	....	
32,000	32,000	.00228	.00014	....	....	
33,000	33,000	.00252	.00024	....	....	
34,000	34,000	.00278	.00026	....	....	
35,000	35,000	.00306	.00028	.00138	.00084	
36,000	36,000	.00344	.00038	....	....	
37,000	37,000	.00374	.00030	....	....	
38,000	38,000	.00418	.00044	....	....	
39,000	39,000	.00462	.00044	....	....	
40,000	40,000	.00500	.00038	.00308	.00170	
41,000	41,000	.00560	.00060	....	....	
42,000	42,000	.00594	.00034	....	....	
43,000	43,000	.00640	.00046	....	....	
44,000	44,000	.00698	.00058	....	....	
45,000	45,000	.00754	.00056	.00530	.00222	
46,000	46,000	.00800	.00046	....	....	
47,000	47,000	.00840	.00040	....	....	
48,000	48,000	.00884	.00044	....	....	
49,000	49,000	.00938	.00054	....	....	
50,000	50,000	.00980	.00042	.00734	.00204	
59,570	59,570	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1064.

Marks, $\overset{12\,M\,R_{78}\,T\,R_{2}}{B\,R_{10}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00056	.00006	....	....	
13,000	13,000	.00060	.00004	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00070	.00006	.00006	.00004	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00090	.00008	....	....	
19,000	19,000	.00094	.00004	....	....	
20,000	20,000	.00102	.00008	.00012	.00006	
21,000	21,000	.00110	.00008	....	....	
22,000	22,000	.00116	.00006	....	....	
23,000	23,000	.00122	.00006	....	....	
24,000	24,000	.00132	.00010	....	....	
25,000	25,000	.00140	.00008	.00024	.00012	
26,000	26,000	.00150	.00010	....	....	
27,000	27,000	.00160	.00010	....	....	
28,000	28,000	.00170	.00010	....	....	
29,000	29,000	.00186	.00016	....	....	
30,000	30,000	.00202	.00016	.09060	.00036	
31,000	31,000	.00222	.00020	....	....	
32,000	32,000	.00240	.00018	....	....	
33,000	33,000	.00260	.00020	....	....	
34,000	34,000	.00296	.00036	....	....	
35,000	35,000	.00330	.00034	.00162	.00102	
36,000	36,000	.00376	.00046	....	....	
37,000	37,000	.00410	.00034	....	....	
38,000	38,000	.00440	.00030	....	....	
39,000	39,000	.00496	.00056	....	....	
40,000	40,000	.00554	.00058	.00358	.00196	
42,000	42,000	.00650	.00072	....	....	
43,000	43,000	.00722	.00072	....	....	
44,000	44,000	.00768	.00046	....	....	
45,000	45,000	.00832	.00064	.00608	.00250	
46,000	46,000	.00890	.00058	....	....	
47,000	47,000	.00930	.00040	....	....	
48,000	48,000	.00992	.00062	....	....	
49,000	49,000	.01070	.00078	....	....	
50,000	50,000	.01132	.00062	.00874	.00266	
60,560	60,560	....	....	....	....	Ultimate strength.

Failed by triple flexure,

No. 1065.

Marks, $\overset{12\,\mathrm{M\,R_{12}\,T\,R_1}}{\mathrm{M\,T_2}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00018	.00006	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00030	.00006			
8,000	8,000	.00036	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006			
12,000	12,000	.00054	.00004			
13,000	13,000	.00060	.00006			
14,000	14,000	.00066	.00006			
15,000	15,000	.00072	.00006	.00004	.00002	
16,000	16,000	.00078	.00006			
17,000	17,000	.00082	.00004			
18,000	18,000	.00088	.00006			
19,000	19,000	.00094	.00006			
20,000	20,000	.00100	.00006	.00010	.00006	
21,000	21,000	.00108	.00008			
22,000	22,000	.00114	.00006			
23,000	23,000	.00122	.00008			
24,000	24,000	.00130	.00008			
25,000	25,000	.00138	.00008	.00020	.00010	
26,000	26,000	.00146	.00008			
27,000	27,000	.00152	.00006			
28,000	28,000	.00160	.00008			
29,000	29,000	.00176	.00016			
30,000	30,000	.00188	.00012	.00048	.00028	
31,000	31,000	.00202	.00014			
32,000	32,000	.00218	.00016			
33,000	33,000	.00240	.00022			
34,000	34,000	.00262	.00022			
35,000	35,000	.00294	.00032	.00128	.00080	
36,000	36,000	.00328	.00034			
37,000	37,000	.00356	.00028			
38,000	38,000	.00380	.00024			
39,000	39,000	.00426	.00046			
40,000	40,000	.00478	.00052	.00286	.00158	
41,000	41,000	.00522	.00044			
42,000	42,000	.00556	.00034			
43,000	43,000	.00592	.00036			
44,000	44,000	.00632	.00040			
45,000	45,000	.00694	.00062	.00460	.00174	
46,000	46,000	.00710	.00016			Deflects. Micrometer on the convex side.
47,000	47,000	.00724	.00014			
48,000	48,000	.00732	.00008			
49,000	49,000	.00738	.00006			
50,000	50,000	.00736	.00002	.00518	.00058	
58,400	58,400					Ultimate strength.

Failed by triple flexure.

BODY No. 23 (second casting).

No. 4755.

Marks, $\begin{matrix}12\ M\ R_{23}\ T\ R_2\\ B\ T_{11}\end{matrix}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045			
3,000	3,000	.000090	.000045			
4,000	4,000	.000140	.000050			
5,000	5,000	.000185	000045	0.		
6,000	6,000	.000235	000050			
7,000	7,000	.000285	.000050			
8,000	8,000	.000340	.000055			
9,000	9,000	.000390	.000050			
10,000	10,000	.000445	.000055	0.		
11,000	11,000	.000505	.000060			
12,000	12,000	.000565	.000060	.000010	.000010	
13,000	13,000	.000640	.000075			
14,000	14,000	.000705	.000065	.000045	.000035	
15,000	15,000	.000785	.000080			
16,000	16,000	.000860	.000075	.000090	.000045	
17,000	17,000	.000955	.000095			
18,000	18,000	.001050	.000095	.000145	.000055	
19,000	19,000	.001150	.000100			
20,000	20,000	.001290	.000140	.000245	.000100	
21,000	21,000	.001410	.000120			
22,000	22,000	.001570	.000160	.000400	.000155	
23,000	23,000	.001775	.000205			
24,000	24,000	.002010	.000235	.000695	.000295	
25,000	25,000	.002315	.000305	.000905	.000210	
28,420	28,420					Tensile strength.

Fractured 2″.7 from neck. Appearance, granular.

No. 4756.

Marks, $\substack{12\ \mathrm{M\ R_B\ T\ R_1} \\ \mathrm{M\ T_{11}}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000040	.000040	....	....	
3,000	3,000	000090	.000050	....	....	
4,000	4,000	.000140	.000050	....	....	
5,000	5,000	.000185	.000045	0.	....	
6,000	6,000	.000235	.000050	....	....	
7,000	7,000	.000285	.000050	....	....	
8,000	8,000	.000335	.000050	....	....	
9,000	9,000	.000390	.000055	....	....	
10,000	10,000	.000445	.000055	0.	....	
11,000	11,000	.000495	.000050	....	....	
12,000	12,000	.000555	.000060	.000020	.000020	
13,000	13,000	.000605	.000050	....	....	
14,000	14,000	.000665	.000060	.000025	.000005	
15,000	15,000	.000730	.000065	....	....	
16,000	16,000	.000805	.000075	.000050	.000025	
17,000	17,000	.000880	.000075	....	....	
18,000	18,000	.000945	.000065	.000095	.000045	
19,000	19,000	.001020	.000075	....	....	
20,000	20,000	.001105	.000085	.000145	.000050	
21,000	21,000	.001190	.000085	....	....	
22,000	22,000	.001300	.000110	.000205	.000060	
23,000	23,000	.001405	.000105	....	....	
24,000	24,000	.001550	.000145	.000325	.000120	
25,000	25,000	.001700	.000150	.000405	.000080	
28,890	28,890	....	....	....	....	Tensile strength.

Fractured at neck. Appearance, granular.

No. 1088.

Marks, $^{12\,M\,R_{22}\,T\,R_{2}}_{B\,T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00032	.00006	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	0.	....	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00002	.00002	
16,000	16,000	.00080	.00008	....	....	
17,000	17,000	.00086	.00006	....	....	
18,000	18,000	.00094	.00008	....	....	
19,000	19,000	.00100	.00006	....	....	
20,000	20,000	.00104	.00004	.00010	.00008	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00118	.00008	....	....	
23,000	23,000	.00124	.00006	....	....	
24,000	24,000	.00132	.00008	....	....	
25,000	25,000	.00140	.00008	.00020	.00010	
26,000	26,000	.00150	.00010	....	....	
27,000	27,000	.00160	.00010	....	....	
28,000	28,000	.00170	.00010	....	....	
29,000	29,000	.00182	.00012	....	....	
30,000	30,000	.00200	.00018	.00052	.00032	
31,000	31,000	.00216	.00016	....	....	
32,000	32,000	.00234	.00018	....	....	
33,000	33,000	.00260	.00026	....	....	
34,000	34,000	.00290	.00030	....	....	
35,000	35,000	.00314	.00024	.00140	.00088	
36,000	36,000	.00340	.00026	....	....	
37,000	37,000	.00370	.00030	....	....	
38,000	38,000	.00424	.00054	....	....	
39,000	39,000	.00476	.00052	....	....	
40,000	40,000	.00522	.00046	.00320	.00180	
41,000	41,000	.00558	.00036	....	....	
42,000	42,000	.00610	.00052	....	....	
43,000	43,000	.00686	.00076	....	....	
44,000	44,000	.00720	.00034	....	....	
45,000	45,000	.00810	.00090	.00576	.00256	
46,000	46,000	.00874	.00064	....	....	
47,000	47,000	.00920	.00046	....	....	
48,000	48,000	.00978	.00058	....	....	
49,000	49,000	.01042	.00064	....	....	
50,000	50,000	.01120	.00078	.00858	.00282	
59,720	59,720	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1089.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{72}\,\mathrm{T}\,\mathrm{R}_{3}}_{\mathrm{B}\,\mathrm{R}_{20}}$
Length, 10''.5.
Diameter, 1''.129.
Sectional area, 1 square inch.
Gauged length, 5''.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00042	.00004	0.	....	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00070	.00006	.00002	.00002	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00090	.00008	....	....	
19,000	19,000	.00094	.00004	....	....	
20,000	20,000	.00100	.00006	.00008	.00006	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00114	.00008	....	....	
23,000	23,000	.00122	.00008	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00138	.00008	.00020	.00012	
26,000	26,000	.00146	.00008	....	....	
27,000	27,000	.00156	.00010	....	....	
28,000	28,000	.00168	.00012	....	....	
29,000	29,000	.00180	.00012	....	....	
30,000	30,000	.00200	.00020	.00056	.00036	
31,000	31,000	.00216	.00016	....	....	
32,000	32,000	.00234	.00018	....	....	
33,000	33,000	.00260	.00026	....	....	
34,000	34,000	.00290	.00030	....	....	
35,000	35,000	.00332	.00042	.00160	.00104	
36,000	36,000	.00360	.00028	....	....	
37,000	37,000	.00400	.00040	....	....	
38,000	38,000	.00430	.00030	....	....	
39,000	39,000	.00486	.00056	....	....	
40,000	40,000	.00546	.00060	.00346	.00186	
41,000	41,000	.00590	.00044	....	....	
42,000	42,000	.00636	.00046	....	....	
43,000	43,000	.00690	.00054	....	....	
44,000	44,000	.00756	.00066	....	....	
45,000	45,000	.00830	.00074	.00000	.00254	
46,000	46,000	.00890	.00060	....	....	
47,000	47,000	.00940	.00050	....	....	
48,000	48,000	.01000	.00060	....	....	
49,000	49,000	.01092	.00092	....	....	
50,000	50,000	.01160	.00068	.00898	.00298	
60,320	60,320	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1090.

Marks, $\overset{12\ M\ R_{18}\ T\ R_1}{M\ T_{18}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	…………	…………	
3,000	3,000	.00010	.00006	…………	…………	
4,000	4,000	.00014	.00004	…………	…………	
5,000	5,000	.00018	.00004	0.	…………	
6,000	6,000	.00022	.00004	…………	…………	
7,000	7,000	.00028	.00006	…………	…………	
8,000	8,000	.00032	.00004	…………	…………	
9,000	9,000	.00038	.00006	…………	…………	
10,000	10,000	.00042	.00004	0.	…………	
11,000	11,000	.00050	.00008	…………	…………	
12,000	12,000	.00054	.00004	…………	…………	
13,000	13,000	.00060	.00006	…………	…………	
14,000	14,000	.00064	.00004	…………	…………	
15,000	15,000	.00070	.00006	.00002	.00002	
16,000	16,000	.00076	.00006	…………	…………	
17,000	17,000	.00082	.00006	…………	…………	
18,000	18,000	.00088	.00006	…………	…………	
19,000	19,000	.00094	.00006	…………	…………	
20,000	20,000	.00100	.00006	.00008	.00006	
21,000	21,000	.00106	.00006	…………	…………	
22,000	22,000	.00112	.00006	…………	…………	
23,000	23,000	.00120	.00008	…………	…………	
24,000	24,000	.00128	.00008	…………	…………	
25,000	25,000	.00134	.00006	.00014	.00006	
26,000	26,000	.00140	.00006	…………	…………	
27,000	27,000	.00148	.00008	…………	…………	
28,000	28,000	.00156	.00008	…………	…………	
29,000	29,000	.00166	.00010	…………	…………	
30,000	30,000	.00176	.00010	.00030	.00016	
31,000	31,000	.00188	.00012	…………	…………	
32,000	32,000	.00200	.00012	…………	…………	
33,000	33,000	.00210	.00010	…………	…………	
34,000	34,000	.00224	.00014	…………	…………	
35,000	35,000	.00246	.00022	.00074	.00044	
36,000	36,000	.00204	.00018	…………	…………	
37,000	37,000	.00280	.00016	…………	…………	
38,000	38,000	.00316	.00036	…………	…………	
39,000	39,000	.00342	.00026	…………	…………	
40,000	40,000	.00364	.00022	.00164	.00090	
41 000	41,000	.00416	.00052	…………	…………	
42,000	42,000	.00440	.00024	…………	…………	
43,000	43,000	.00502	.00062	…………	…………	
44,000	44,000	.00548	.00046	…………	…………	
45,000	45,000	.00600	.00052	.00370	.00206	
46,000	46,000	.00658	.00058	…………	…………	
47,000	47,000	.00690	.00032	…………	…………	
48,000	48.000	.00760	.00070	…………	…………	
49,000	49,000	.00822	.00062	…………	…………	
50,000	50,000	.00922	.00100	.00654	.00284	
60,820	60,820	…………	…………	…………	…………	Ultimate strength.

Failed by triple flexure.

BODY NO. 24.

No. 4697.

Marks, $^{12\,\mathrm{M\,R_{24}\,T\,R_2}}_{\mathrm{B\,T_1}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000053	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000160	.000055	....	....	
5,000	5,000	.000215	.000055	0.	....	
6,000	6,000	.000270	.000055	....	....	
7,000	7,000	.000340	.000070	....	....	
8,000	8,000	.000400	.000060	....	....	
9,000	9,000	.000455	.000055	....	....	
10,000	10,000	.000520	.000065	.000035	.000035	
11 000	11,000	.000590	.000070	....	....	
12,000	12,000	.000655	.000065	.000050	.000015	
13,000	13,000	.000725	.000070	....	....	
14,000	14,000	.000800	.000075	.000090	.000040	
15,000	15,000	.000890	.000090	....	....	
16,000	16,000	.000980	.000090	.000140	.000050	
17,000	17,000	.001070	.000090	....	....	
18,000	18,000	.001195	.000125	.000205	.000065	
19,000	19,000	.001300	.000105	....	....	
20,000	20,000	.001430	.000130	.000320	.000115	
21,000	21,000	.001595	.000165	....	....	
22,000	22,000	.001775	.000180	.000520	.000200	
23,000	23,000	.002000	.000225	....	....	
24,000	24,000	.002295	.000295	.000865	.000345	
25,000	25,000	.002650	.000355	.001155	.000290	
27,160	27,160	....	....	....	....	Tensile strength.

Fractured 10″.5 from neck. Appearance, granular.

No. 4698.

Marks, $\substack{^{12}M\ R_{74}\ T\ R_1 \\ M\ T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000355	.000055	....	....	
9,000	9,000	.000405	.000050	....	....	
10,000	10,000	.000470	.000065	.000010	.000010	
11,000	11,000	.000535	.000065	....	....	
12,000	12,000	.000590	.000055	.000035	.000025	
13,000	13,000	.000655	.000065	....	....	
14,000	14,000	.000710	.000055	.000050	.000015	
15,000	15,000	.000780	.000070	....	....	
16,000	16,000	.000850	.000070	.000065	.000015	
17,000	17,000	.000920	.000070	....	....	
18,000	18,000	.001000	.000080	.000120	.000055	
19,000	19,000	.001075	.000075	....	....	
20,000	20,000	.001160	.000085	.000155	.000035	
21,000	21,000	.001260	.000100	....	....	
22,000	22,000	.001375	.000115	.000250	.000095	
23,000	23,000	.001600	.000225	....	....	
24,000	24,000	.001800	.000200	.000550	.000300	
25,000	25,000	.001960	.000160	.000655	.000105	
28,560	28,560	....	....	....	....	Tensile strength.

Fractured at neck. Appearance, granular.

No. 1066.

Marks, $^{12\ M\ R_{14}\ T\ R_2}_{B\ T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00010	.00006			
4,000	4,000	.00014	.00004			
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00026	.00006			
7,000	7,000	.00032	.00006			
8,000	8,000	.00038	.00006			
9,000	9,000	.00044	.00006			
10,000	10,000	.00050	.00006	.00004	.00002	
11,000	11,000	.00056	.00006			
12,000	12,000	.00062	.00006			
13,000	13,000	.00068	.00006			
14,000	14,000	.00074	.00006			
15,000	15,000	.00080	.00006	.00008	.00004	
16,000	16,000	.00088	.00008			
17,000	17,000	.00094	.00006			
18,000	18,000	.00100	.00006			
19,000	19,000	.00106	.00006			
20,000	20,000	.00112	.00006	.00018	.00010	
21,000	21,000	.00120	.00008			
22,000	22,000	.00128	.00008			
23,000	23,000	.00132	.00004			
24,000	24,000	.00144	.00012			
25,000	25,000	.00154	.00010	.00036	.00018	
26,000	26,000	.00164	.00010			
27,000	27.000	.00176	.00012			
28,000	28,000	.00192	.00016			
29,000	29,000	.00208	.00016			
30,000	30,000	.00226	.00018	.00078	.00042	
31,000	31,000	.00246	.00020			
32,000	32,000	.00266	.00020			
33,000	33,000	.00292	.00026			
34,000	34,000	.00326	.00034			
35,000	35,000	.00372	.00046	.00196	.00118	
36,000	36,000	.00410	.00038			
37,000	37,000	.00440	.00030			
38,000	38,000	.00490	.00050			
39,000	39,000	.00546	.00056			
40,000	40,000	.00598	.00052	.00392	.00196	
41,000	41,000	.00642	.00044			
42,000	42,000	.00692	.00050			
43,000	43,000	.00748	.00056			
44,000	44,000	.00810	.00062			
45,000	45,000	.00882	.00072	.00642	.00250	
46,000	46,000	.00930	.00048			
47,000	47,000	.00994	.00064			
48,000	48,000	.01074	.00080			
49,000	49,000	.01160	.00086			
50,000	50,000	.01240	.00080	.00968	.00326	
60,040	60,040					Ultimate strength.

Failed by triple flexure.

No. 1067.

Marks, $\underset{B\ R_{10}}{12\ M\ R_{24}\ T\ R_3}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00042	.00006	....	....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00052	.00004	....	....	
12,000	12,000	.00058	.00006	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00008	.00006	
16,000	16,000	.00082	.00006	....	....	
17,000	17,000	.00088	.00006	....	....	
18,000	18,000	.00094	.00006	....	....	
19,000	19,000	.00100	.00006	....	....	
20,000	20,000	.00108	.00008	.00012	.00004	
21,000	21,000	.00116	.00008	....	....	
22,000	22,000	.00122	.00006	....	....	
23,000	23,000	.00130	.00008	....	....	
24,000	24,000	.00136	.00006	....	....	
25,000	25,000	.00144	.00008	.00024	.00012	
26,000	26,000	.00156	.00012	....	....	
27,000	27,000	.00168	.00012	....	....	
28,000	28,000	.00178	.00010	....	....	
29,000	29,000	.00192	.00014	....	....	
30,000	30,000	.00210	.00018	.00064	.00040	
31,000	31,000	.00234	.00024	....	....	
32,900	32,000	.00254	.00020	....	....	
33,000	33,000	.00286	.00032	....	....	
34,000	34,000	.00318	.00032	....	....	
35,000	35,000	.00350	.00032	.00176	.00112	
36,000	36,000	.00390	.00040	....	....	
37,000	37,000	.00432	.00042	....	....	
38,000	38,000	.00470	.00038	....	....	
39,000	39,000	.00522	.00052	....	....	
40,000	40,000	.00580	.00058	.00380	.00204	
41,000	41,000	.00634	.00054	....	....	
42,000	42,000	.00674	.00040	....	....	
43,000	43,000	.00724	.00050	....	....	
44,000	44,000	.00776	.00052	....	....	
45,000	45,000	.00812	.00036	.00582	.00202	
46,000	46,000	.00852	.00040	....	....	
47,000	47,000	.00902	.00050	....	....	
48,000	48,000	.00930	.00028	....	....	
49,000	49,000	.00950	.00020	....	....	
50,000	50,000	.00958	.00008	.00720	.00138	
59,200	59,200	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1068.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{11}\,\mathrm{T}\,\mathrm{R}_1}_{\mathrm{M}\,\mathrm{T}_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00036	.00006	....	....	
9,000	9,000	.00012	.00006	....	....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00056	.00008	....	....	
12,000	12,000	.00062	.00006	....	....	
13,000	13,000	.00068	.00006	....	....	
14,000	14,000	.00074	.00006	....	....	
15,000	15,000	.00080	.00006	.00010	.00008	
16,000	16,000	.00088	.00008	....	....	
17,000	17,000	.00094	.00006	....	....	
18,000	18,000	.00100	.00006	....	....	
19,000	19,000	.00106	.00006	....	....	
20,000	20,000	.00112	.00006	.00016	.00006	
21,000	21,000	.00120	.00008	....	....	
22,000	22,000	.00128	.00008	....	....	
23,000	23,000	.00134	.00006	....	....	
24,000	24,000	.00140	.00006	....	....	
25,000	25,000	.00150	.00010	.00028	.00012	
26,000	26,000	.00160	.00010	....	....	
27,000	27,000	.00170	.00010	....	....	
28,000	28,000	.00180	.00010	....	....	
29,000	29,000	.00192	.00012	....	....	
30,000	30,000	.00210	.00018	.00062	.00034	
31,000	31,000	.00232	.00022	....	....	
32,000	32,000	.00250	.00018	....	....	
33,000	33,000	.00276	.00026	....	....	
34,000	34,000	.00310	.00034	....	....	
35,000	35,000	.00344	.00034	.00170	.00108	
36,000	36,000	.00382	.00038	....	....	
37,000	37,000	.00412	.00030	....	....	
38,000	38,000	.00454	.00042	....	....	
39,000	39,000	.00502	.00048	....	....	
40,000	40,000	.00562	.00060	.00360	.00190	
41,000	41,000	.00596	.00034	....	....	
42,000	42,000	.00652	.00056	....	....	
43,000	43,000	.00700	.00048	....	....	
44,000	44,000	.00760	.00060	....	....	
45,000	45,000	.00802	.00042	.00572	.00212	
46,000	46,000	.00846	.00044	....	....	
47,000	47,000	.00880	.00034	....	....	
48,000	48,000	.00914	.00034	....	....	
49,000	49,000	.00930	.00016	....	....	
50,000	50,000	.00940	.00010	.00698	.00126	
59,900	59,900	....	....	....	....	Ultimate strength.

Failed by triple flexure.

BODY NO. 25.

No. 4709.

Marks, $^{12\,M\,R_{25}\,T\,R_{3}}_{B\,T_{1}}$
Diameter, 1''.129.
Sectional area, 1 square inch.
Length of stem, 23''.
Gauged length, 20''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000110	.000055	....	....	
4,000	4,000	.000160	.000050	....	....	
5,000	5,000	.000225	.000065	.000005	.000005	
6,000	6,000	.000285	.000060	....	....	
7,000	7,000	.000345	.000060	....	....	
8,000	8,000	.000400	.000055	....	....	
9,000	9,000	.000455	.000055	....	....	
10,000	10,000	.000525	.000070	.000030	.000025	
11,000	11,000	.000590	000065	....	....	
12,000	12,000	.000655	.000065	.000055	.000025	
13,000	13,000	.000730	.000075	....	....	
14,000	14,000	.000800	.000070	.000085	.000030	
15,000	15,000	.000895	.000095	....	....	
16,000	16,000	.000990	.000095	.000140	.000055	
17,000	17,000	.001090	.000100	....	....	
18,000	18,000	.001200	.000110	.000200	.000060	
19,000	19,000	.001300	.000100	....	....	
20,000	20,000	.001430	.000130	.000300	.000100	
21,000	21,000	.001600	.000170	....	....	
22,000	22,000	.001775	.000175	.000500	.000200	
23,000	23,000	.001995	.000220	....	....	
24,000	24,000	.002250	.000255	.000810	.000310	
25,900	25,000	.002600	.000350	.001060	.000250	
27,130	27,130	....	....	....	....	Tensile strength.

Fractured 10''.9 from neck. Appearance, granular.

No. 4710.

Marks, $12''\,\mathrm{M}\,\underset{\mathrm{M}}{\mathrm{R}_{24}}\,\underset{\mathrm{T}_1}{\mathrm{T}}\,\mathrm{R}_1$

Diameter, 1.″129.

Sectional area, 1 square inch.

Length of stem, 23″.

Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000405	.000055	....	....	
10,000	10,000	.000455	.000050	.000010	.000010	
11,000	11,000	.000510	.000055	....	....	
12,000	12,000	.000560	.000050	.000030	.000020	
13,000	13,000	.000625	.000065	....	....	
14,000	14,000	.000695	.000070	.000045	.000015	
15,000	15,000	.000750	.000055	....	....	
16,000	16,000	.000810	.000060	.000055	.000010	
17,000	17,000	.000890	.000080	....	....	
18,000	18,000	.000960	.000070	.000095	.000040	
19,000	19,000	.001040	.000080	....	....	
20,000	20,000	.001120	.000080	.000145	.000050	
21,000	21,000	.001225	.000105	....	....	
22,000	22,000	.001320	.000095	.000205	.000060	
23,000	23,000	.001450	.000130	....	....	
24,000	24,000	.001555	.000105	.000325	.000120	
24,720	24,720	....	....	....	....	Tensile strength.

Fractured 11″ from neck. Appearance, granular; coarse spangles.

No. 1070.

Marks, $^{12\ M\ R_{14}\ T\ R_3}_{B\ T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00014	.00006	....	....	
5,000	5,000	.00020	.00006	0.	....	
6,000	6,000	.00028	.00008	....	....	
7,000	7,000	.00034	.00006	....	....	
8,000	8,000	.00038	.00004	....	....	
9,000	9,000	.00046	.00008	....	....	
10,000	10,000	.00052	.00006	.00002	.00002	
11,000	11,000	.00060	.00008	....	....	
12,000	12,000	.00066	.00006	....	....	
13,000	13,000	.00070	.00004	....	....	
14,000	14,000	.00076	.00006	....	....	
15,000	15,000	.00082	.00006	.00006	.00004	
16,000	16,000	.00088	.00006	....	....	
17,000	17,000	.00094	.00006	....	....	
18,000	18,000	.00100	.00006	....	....	
19,000	19,000	.00106	.00006	....	....	
20,000	20,000	.00112	.00006	.00012	.00006	
21,000	21,000	.00120	.00008	....	....	
22,000	22,000	.00130	.00010	....	....	
23,000	23,000	.00138	.00008	....	....	
24,000	24,000	.00144	.00006	....	....	
25,000	25,000	.00152	.00008	.00026	.00014	
26,000	26,000	.00162	.00010	....	....	
27,000	27,000	.00174	.00012	....	....	
28,000	28,000	.00184	.00010	....	....	
29,000	29,000	.00196	.00012	....	....	
30,000	30,000	.00212	.00016	.00060	.00034	
31,000	31,000	.00232	.00020	....	....	
32,000	32,000	.00250	.00018	....	....	
33,000	33,000	.00274	.00024	....	....	
34,000	34,000	.00300	.00026	....	....	
35,000	35,000	.00338	.00038	.00156	.00096	
36,000	36,000	.00370	.00032	....	....	
37,000	37,000	.00398	.00028	....	....	
38,000	38,000	.00442	.00044	....	....	
39,000	39,000	.00500	.00058	....	....	
40,000	40,000	.00558	.00058	.00348	.00192	
41,000	41,000	.00602	.00044	....	....	
42,000	42,000	.00646	.00044	....	....	
43,000	43,000	.00700	.00054	....	....	
44,000	44,000	.00756	.00056	....	....	
45,000	45,000	.00836	.00080	.00592	.00244	
46,000	46,000	.00878	.00042	....	....	
47,000	47,000	.00930	.00052	....	....	
48,000	48,000	.01012	.00082	....	....	
49,000	49,000	.01078	.00066	....	....	
50,000	50,000	.01210	.00132	.00936	.00344	
58,040	58,040	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1071.

Marks, $^{12\,M\,R_{28}\,T\,R_2}_{B\,R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00002	.00002			
3,000	3,000	.00010	.00008			
4,000	4,000	.00016	.00006			
5,000	5,000	.00022	.00006	.00002	.00002	
6,000	6,000	.00028	.00006			
7,000	7,000	.00034	.00006			
8,000	8,000	.00040	.00006			
9,000	9,000	.00048	.00008			
10,000	10,000	.00054	.00006	.00006	.00004	
11,000	11,000	.00060	.00006			
12,000	12,000	.00068	.00008			
13,000	13,000	.00074	.00006			
14,000	14,000	.00080	.00006			
15,000	15,000	.00084	.00004	.00010	.00004	
16,000	16,000	.00090	.00006			
17,000	17,000	.00096	.00006			
18,000	18,000	.00102	.00006			
19,000	19,000	.00108	.00006			
20,000	20,000	.00116	.00008	.00016	.00006	
21,000	21,000	.00122	.00006			
22,000	22,000	.00130	.00008			
23,000	23,000	.00138	.00008			
24,000	24,000	.00146	.00008			
25,000	25,000	.00154	.00008	.00030	.00014	
26,000	26,000	.00166	.00012			
27,000	27,000	.00176	.00010			
28,000	28,000	.00188	.00012			
29,000	29,000	.00202	.00014			
30,000	30,000	.00220	.00018	.00068	.00038	
31,000	31,000	.00238	.00018			
32,000	32,000	.00254	.00016			
33,000	33,000	.00280	.00026			
34,000	34,000	.00312	.00032			
35,000	35,000	.00350	.00038	.00170	.00102	
36,000	36,000	.00392	.00042			
37,000	37,000	.00422	.00030			
38,000	38,000	.00470	.00048			
39,000	39,000	.00528	.00058			
40,000	40,000	.00580	.00052	.00374	.00204	
41,000	41,000	.00628	.00048			
42,000	42,000	.00682	.00054			
43,000	43,000	.00740	.00058			
44,000	44,000	.00828	.00088			
45,000	45,000	.00872	.00044	.00630	.00256	
46,000	46,000	.00944	.00072			
47,000	47,000	.01000	.00056			
48,000	48,000	.01058	.00058			
49,000	49,000	.01178	.00120			
50,000	50,000	.01308	.00130	.01022	.00392	
59,300	59,300					Ultimate strength.

Failed by triple flexure.

No. 1072.

Marks, $^{12\ \mathrm{M\ R_2,\ T\ R_1}}_{\mathrm{M\ T_2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00018	.00006	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00030	.00006			
8,000	8,000	.00036	.00006			
9,000	9,000	.00042	.00006			
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00054	.00006			
12,000	12,000	.00060	.00006			
13,000	13,000	.00066	.00006			
14,000	14,000	.00072	.00006			
15,000	15,000	.00078	.00006	.00004	.00002	
16,000	16,000	.00082	.00004			
17,000	17,000	.00088	.00006			
18,000	18,000	.00094	.00006			
19,000	19,000	.00100	.00006			
20,000	20,000	.00106	.00006	.00010	.00006	
21,000	21,000	.00112	.00006			
22,000	22,000	.00120	.00008			
23,000	23,000	.00126	.00006			
24,000	24,000	.00132	.00006			
25,000	25,000	.00140	.00008	.00018	.00008	
26,000	26,000	.00148	.00008			
27,000	27,000	.00154	.00006			
28,000	28,000	.00162	.00008			
29,000	29,000	.00174	.00012			
30,000	30,000	.00186	.00012	.00040	.00022	
31,000	31,000	.00196	.00010			
32,000	32,000	.00208	.00012			
33,000	33,000	.00222	.00014			
34,000	34,000	.00240	.00018			
35,000	35,000	.00266	.00026	.00092	.00052	
36,000	36,000	.00290	.00024			
37,000	37,000	.00310	.00020			
38,000	38,000	.00336	.00026			
39,000	39,000	.00380	.00044			
40,000	40,000	.00412	.00032	.00210	.00118	
41,000	41,000	.00448	.00036			
42,000	42,000	.00486	.00038			
43,000	43,000	.00520	.00034			
44,000	44,000	.00562	.00042			
45,000	45,000	.00610	.00048	.00384	.00174	
46,000	46,000	.00654	.00044			
47,000	47,000	.00688	.00034			
48,000	48,000	.00710	.00022			
49,000	49,000	.00722	.00012			
50,000	50,000	.00736	.00014	.00496	.00112	
59,700	59,700					Ultimate strength.

Failed by triple flexure.

BODY No. 26.

No. 4719.

Marks, $^{12\,\mathrm{M}\,\mathrm{R}_{26}\,\mathrm{T}\,\mathrm{R}_2}_{\quad\mathrm{B}\,\mathrm{T}_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000255	.000055	....	....	
7,000	7,000	.000305	.000050	....	....	
8,000	8,000	.000360	.000055	....	....	
9,000	9,000	.000410	.000050	....	....	
10,000	10,000	.000470	.000060	.000015	.000015	
11,000	11,000	.000540	.000070	....	....	
12,000	12,000	.000600	.000060	.000045	.000030	
13,000	13,000	.000660	.000060	....	....	
14,000	14,000	.000740	.000080	.000060	.000015	
15,000	15,000	.000800	.000060	....	....	
16,000	16,000	.000865	.000065	.000090	.000030	
17,000	17,000	.000950	.000085	....	....	
18,000	18,000	.001050	.000100	.000150	.000060	
19,000	19,000	.001155	.000105	....	....	
20,000	20,000	.001260	.000105	.000240	.000090	
21,000	21,000	.001395	.000135	....	....	
22,000	22,000	.001520	.000125	.000350	.000110	
23,000	23,000	.001700	.000180	....	....	
24,000	24,000	.001895	.000195	.000585	.000235	
25,000	25,000	.002160	.000265	.000770	.000185	
28,870	28,870	....	....	....	....	Tensile strength.

Fractured, 3″.6 from neck. Appearance, granular.

No. 4720.

Marks, $\overset{12M\,R_{34}\,T\,R_1}{M\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050			
3,000	3,000	.000095	.000045			
4,000	4,000	.000145	.000050			
5,000	5,000	.000195	.000050	.000005	.000005	
6,000	6,000	.000245	.000050			
7,000	7,000	.000295	.000050			
8,000	8,000	.000350	.000055			
9,000	9,000	.000400	.000050			
10,000	10,000	.000450	.000050	.000015	.000010	
11,000	11,000	.000500	.000050			
12,000	12,000	.000560	.000060	.000030	.000015	
13,000	13,000	.000615	.000055			
14,000	14,000	.000680	.000065	.000045	.000015	
15,000	15,000	.000740	.000060			
16,000	16,060	.000800	.000060	.000055	.000010	
17,000	17,000	.000875	.000075			
18,000	18,000	.000940	.000065	.000095	.000040	
19,000	19,000	.001010	.000070			
20,000	20,000	.001095	.000085	.000120	.000025	
21,000	21,000	.001195	.000100			
22,000	22,000	.001290	.000095	.000200	.000080	
23,000	23,000	.001400	.000110			
24,000	24,000	.001520	.000120	.000305	.000105	
25,000	25,000	.001700	.000180	.000410	.000105	
26,310	26,310					Tensile strength.

Fractured 10″.3 from neck. Appearance, granular.

No. 1076.

Marks, $^{12\,\mathrm{M\,R_{34}\,T\,R_2}}_{\mathrm{B\,T_3}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	....	....	
3,000	3,000	.00012	.00006	....	....	
4,000	4,000	.00016	.00004	....	....	
5,000	5,000	.00022	.00006	.00004	.00004	
6,000	6,000	.00026	.00004	....	....	
7,000	7,000	.00032	.00006	....	....	
8,000	8,000	.00038	.00006	....	....	
9,000	9,000	.00044	.00006	....	....	
10,000	10,000	.00048	.00004	.00006	.00002	
11,000	11,000	.00054	.00006	....	....	
12,000	12,000	.00058	.00004	....	....	
13,000	13,000	.00064	.00006	....	....	
14,000	14,000	.00070	.00006	....	....	
15,000	15,000	.00076	.00006	.00008	.00002	
16,000	16,000	.00082	.00006	....	....	
17,000	17,000	.00086	.00004	....	....	
18,000	18,000	.00092	.00006	....	....	
19,000	19,000	.00098	.00006	....	....	
20,000	20,000	.00104	.00006	.00012	.00004	
21,000	21,000	.00110	.00006	....	....	
22,000	22,000	.00116	.00006	....	....	
23,000	23,000	.00122	.00006	....	....	
24,000	24,000	.00130	.00008	....	....	
25,000	25,000	.00136	.00006	.00018	.00006	
26,000	26,000	.00144	.00008	....	....	
27,000	27,000	.00152	.00008	....	....	
28,000	28,000	.00160	.00008	....	....	
29,000	29,000	.00170	.00010	....	....	
30,000	30,000	.00180	.00010	.00038	.00020	
31,000	31,000	.00196	.00016	....	....	
32,000	32,000	.00208	.00012	....	....	
33,000	33,000	.00220	.00012	....	....	
34,000	34,000	.00236	.00016	....	....	
35,000	35,000	.00260	.00024	.00088	.00050	
36,000	36,000	.00284	.00024	....	....	
37,000	37,000	.00308	.00024	....	....	
38,000	38,000	.00340	.00032	....	....	
39,000	39,000	.00380	.00040	....	....	
40,000	40,000	.00424	.00044	.00224	.00136	
41,000	41,000	.00468	.00044	....	....	
42,000	42,000	.00506	.00038	....	....	
43,000	43,000	.00552	.00046	....	....	
44,000	44,000	.00608	.00056	....	....	
45,000	45,000	.00652	.00044	.00422	.00198	
46,000	46,000	.00700	.00048	....	....	
47,000	47,000	.00742	.00042	....	....	
48,000	48,000	.00806	.00064	....	....	
49,000	49,000	.00876	.00070	....	....	
50,000	50,000	.00934	.00058	.00672	.00250	
62,520	62,520	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1077.

Marks, $^{12\ \mathrm{M\ R_{36}\ T\ R_3}}_{\mathrm{B\ R_{16}}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	0.	....	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00030	.00006	....	....	
8,000	8,000	.00034	.00004	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00064	.00004	....	....	
15,000	15,000	.00070	.00006	.00004	.00002	
16,000	16,000	.00078	.00008	....	....	
17,000	17,000	.00082	.00004	....	....	
18,000	18,000	.00088	.00006	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00100	.00006	.00010	.00006	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00112	.00006	....	....	
23,000	23,000	.00118	.00006	....	....	
24,000	24,000	.00124	.00006	....	....	
25,000	25,000	.00134	.00010	.00020	.00010	
26,000	26,000	.00144	.00010	....	....	
27,000	27,000	.00154	.00010	....	....	
28,000	28,000	.00162	.00008	....	....	
29,000	29,000	.00174	.00012	....	....	
30,000	30,000	.00186	.00012	.00046	.00026	
31,000	31,000	.00200	.00014	....	....	
32,000	32,000	.00212	.00012	....	....	
33,000	33,000	.00232	.00020	....	....	
34,000	34,000	.00260	.00028	....	....	
35,000	35,000	.00288	.00028	.00122	.00076	
36,000	36,000	.00332	.00044	....	....	
37,000	37,000	.00366	.00034	....	....	
38,000	38,000	.00416	.00050	....	....	
39,000	39,000	.00462	.00046	....	....	
40,000	40,000	.00510	.00048	.00312	.00190	
41,000	41,000	.00558	.00048	....	....	
42,000	42,000	.00592	.00034	....	....	
43,000	43,000	.00660	.00078	....	....	
44,000	44,000	.00722	.00062	....	....	
45,000	45,000	.00786	.00064	.00560	.00248	
46,000	46,000	.00840	.00054	....	....	
47,000	47,000	.00882	.00042	....	....	
48,000	48,000	.00930	.00048	....	....	
49,000	49,000	.00996	.00066	....	....	
50,000	50,000	.01078	.00082	.00820	.00260	
62,586	62,580	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1078.

Marks, $^{12\,\mathrm{M\,R_2\,T\,R_1}}_{\mathrm{M\,T_2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00014	.00006			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00024	.00006			
7,000	7,000	.00028	.00004			
8,000	8,000	.00034	.00006			
9,000	9,000	.00040	.00006			
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006			
12,000	12,000	.00054	.00004			
13,000	13,000	.00060	.00006			
14,000	14,000	.00066	.00006			
15,000	15,000	.00072	.00006	.00004	.00002	
16,000	16,000	.00076	.00004			
17,000	17,000	.00084	.00008			
18,000	18,000	.00090	.00006			
19,000	19,000	.00094	.00004			
20,000	20,000	.00102	.00008	.00012	.00008	
21,000	21,000	.00108	.00006			
22,000	22,000	.00114	.00006			
23,000	23,000	.00122	.00008			
24,000	24,000	.00128	.00006			
25,000	25,000	.00136	.00008	.00020	.00008	
26,000	26,000	.00144	.00008			
27,000	27,000	.00150	.00006			
28,000	28,000	.00160	.00010			
29,000	29,000	.00172	.00012			
30,000	30,000	.00182	.00010	.00042	.00022	
31,000	31,000	.00200	.00018			
32,000	32,000	.00212	.00012			
33,000	33,000	.00230	.00018			
34,000	34,000	.00250	.00020			
35,000	35,000	.00286	.00036	.00120	.00078	
36,000	36,000	.00306	.00020			
37,000	37,000	.00346	.00040			
38,000	38,000	.00382	.00036			
39,000	39,000	.00410	.00028			
40,000	40,000	.00484	.00074	.00288	.00168	
41,000	41,000	.00524	.00040			
42,000	42,000	.00556	.00032			
43,000	43,000	.00604	.00048			
44,000	44,000	.00652	.00048			
45,000	45,000	.00718	.00066	.00490	.00262	
46,000	46,000	.00768	.00050			
47,000	47,000	.00812	.00044			
48,000	48,000	.00854	.00042			
49,000	49,000	.00920	.00066			
50,000	50,000	.00966	.00046	.00718	.00228	
62,750	62,750					Ultimate strength.

Failed by triple flexure.

BODY No. 27.

No. 4739.

Marks, $^{12\ \mathrm{M\ R_T\ T\ R_2}}_{\qquad\mathrm{B\ T_1}}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length of stem, 23″.

Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	....	....	
3,000	3,000	.000105	.000050	....	....	
4,000	4,000	.000155	.000050	....	....	
5,000	5,000	.000210	.000055	0.	....	
6,000	6,000	.000265	.000055	....	....	
7,000	7,000	.000325	.000060	....	....	
8,000	8,000	.000375	.000050	....	....	
9,000	9,000	.000445	.000070	....	....	
10,000	10,000	.000500	.000055	.000020	.000020	
11,000	11,000	.000570	.000070	....	....	
12,000	12,000	.000640	.000070	.000050	.000030	
13,000	13,000	.000710	.000070	....	....	
14,000	14,000	.000790	.000080	.000085	.000035	
15,000	15,000	.000875	.000085	....	....	
16,000	16,000	.000945	.000070	.000110	.000025	
17,000	17,000	.001010	.000065	....	....	
18,000	18,000	.001095	.000085	.000130	.000020	
19,000	19,000	.001200	.000105	....	....	
20,000	20,000	.001330	.000130	.000240	.000110	
21,000	21,000	.001500	.000170	....	....	
22,000	22,000	.001685	.000185	.000440	.000200	
23,000	23,000	.001915	.000230	....	....	
24,000	24,000	.002125	.000210	.000785	.000345	
25,000	25,000	.002550	.000425	.001055	.000270	
25,940	25,940	....	....	....	....	Tensile strength.

Fractured 5″.1 from neck. Appearance, granular.

No. 4740.

Marks, $^{12\,\mathrm{M\,R_F\,T\,R,}}_{\mathrm{M\,T,}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	....	....	
3,000	3,000	.000100	.000050	....	....	
4,000	4,000	.000150	.000050	....	....	
5,000	5,000	.000200	.000050	0.	....	
6,000	6,000	.000250	.000050	....	....	
7,000	7,000	.000300	.000050	....	....	
8,000	8,000	.000350	.000050	....	....	
9,000	9,000	.000400	.000050	....	....	
10,000	10,000	.000450	.000050	.000010	.000010	
11,000	11,000	.000500	.000050	....	....	
12,000	12,000	.000550	.000050	.000015	.000005	
13,000	13,000	.000610	.000060	....	....	
14,000	14,000	.000665	.000055	.000040	.000025	
15,000	15,000	.000730	.000065	....	....	
16,000	16,000	.000790	.000060	.000055	.000015	
17,000	17,000	.000850	.000060	....	....	
18,000	18,000	.000910	.000060	.000085	.000030	
19,000	19,000	.000990	.000080	....	....	
20,000	20,000	.001060	.000070	.000110	.000025	
21,000	21,000	.001155	.000095	....	....	
22,000	22,000	.001225	.000070	.000170	.000060	
23,000	23,000	.001325	.000100	....	....	
24,000	24,000	.001410	.000085	.000250	.000080	
25,000	25,000	.001550	.000140	.000315	.000065	
26,580	26,580	....	....	....	....	Tensile strength.

Fractured at the neck. Appearance, granular.

No. 1079.

Marks, $^{12\,M\,R_{2}\,T\,R_{2}}_{\quad\; B\,T_{1}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00004	.00004	
6,000	6,000	.00024	.00006	....	....	
7,000	7,000	.00028	.00004	....	....	
8,000	8,000	.00034	.00006	....	....	
9,000	9,000	.00038	.00004	....	....	
10,000	10,000	.00044	.00006	.00006	.00002	
11,000	11,000	.00050	.00006	....	....	
12,000	12,000	.00054	.00004	....	....	
13,000	13,000	.00060	.00006	....	....	
14,000	14,000	.00066	.00006	....	....	
15,000	15,000	.00072	.00006	.00008	.00002	
16,000	16,000	.00078	.00006	....	....	
17,000	17,000	.00082	.00004	....	....	
18,000	18,000	.00090	.00008	....	....	
19,000	19,000	.00096	.00006	....	....	
20,000	20,000	.00102	.00006	.00012	.00004	
21,000	21,000	.00110	.00008	....	....	
22,000	22,000	.00118	.00008	....	....	
23,000	23,000	.00124	.00006	....	....	
24,000	24,000	.00132	.00008	....	....	
25,000	25,000	.00140	.00008	.00024	.00012	
26,000	26,000	.00150	.00010	....	....	
27,000	27,000	.00160	.00010	....	....	
28.000	28,000	.00170	.00010	....	....	
29,000	29,000	.00180	.00010	....	....	
30,000	30,000	.00192	.00012	.00050	.00026	
31,000	31,000	.00212	.00020	....	....	
32,000	32,000	.00228	.00016	....	....	
33,000	33,000	.00246	.00018	....	....	
34,000	34,000	.00272	.00026	....	....	
35,000	35,000	.00306	.00034	.00136	.00086	
36,000	36,000	.00334	.00028	....	....	
37,000	37,000	.00366	.00032	....	....	
38,000	38,000	.00408	.00042	....	....	
39,000	39,000	.00448	.00040	....	....	
40,000	40,000	.00500	.00052	.00300	.00164	
41,000	41,000	.00552	.00052	....	....	
42,000	42,000	.00584	.00032	....	....	
43,000	43,000	.00646	.00062	....	....	
44,000	44,000	.00700	.00054	....	....	
45,000	45,000	.00780	.00080	.00546	.00246	
46,000	46,000	.00822	.00042	....	....	
47,000	47,000	.00870	.00048	....	....	
48,000	48,000	.00928	.00058	....	....	
49,000	49,000	.00982	.00054	....	....	
50,000	50,000	.01060	.00078	.00802	.00256	
59,100	59,100	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1080.

Marks, $\substack{12\,M\,R_{17}\,T\,R_{3}\\B\,R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00008	.00004	....	....	
4,000	4,000	.00012	.00004	....	....	
5,000	5,000	.00018	.00006	0.	....	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00026	.00004	....	....	
8,000	8,000	.00030	.00004	....	....	
9,000	9,000	.00036	.00006	....	....	
10,000	10,000	.00042	.00006	0.	....	
11,000	11,000	.00048	.00006	....	....	
12,000	12,000	.00052	.00004	....	....	
13,000	13,000	.00058	.00006	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00070	.00006	.00002	.00002	
16,000	16,000	.00076	.00006	....	....	
17,000	17,000	.00080	.00004	....	....	
18,000	18,000	.00088	.00008	....	....	
19,000	19,000	.00094	.00006	....	....	
20,000	20,000	.00100	.00006	.00010	.00008	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00112	.09006	....	....	
23,000	23,000	.00120	.00008	....	....	
24,000	24,000	.00130	.00010	....	....	
25,000	25,000	.00138	.00008	.00020	.00010	
26,000	26,000	.00146	.00008	....	....	
27,000	27,000	.00160	.00014	....	....	
28,000	28,000	.00172	.00012	....	....	
29,000	29,000	.00178	.00006	....	....	
30,000	30,000	.00188	.00010	.00048	.00028	
31,000	31,000	.00204	.00016	....	....	
32,000	32,000	.00220	.00016	....	....	
33,000	33,000	.00240	.00020	....	....	
34,000	34,000	.00260	.00020	....	....	
35,000	35,000	.00300	.00040	.00132	.00084	
36,000	36,000	.00332	.00032	....	....	
37,000	37,000	.00362	.00030	....	....	
38,000	38,000	.00402	.00040	....	....	
39,000	39,000	.00442	.00040	....	....	
40,000	40,000	.00502	.00060	.00306	.00174	
41,000	41,000	.00552	.00050	....	....	
42,000	42,000	.00592	.00040	....	....	
43,000	43,000	.00648	.00056	....	....	
44,000	44,000	.00692	.00044	....	....	
45,000	45,000	.00730	.00038	.00508	.00202	
46,000	46,000	.00784	.00054	....	....	
47,000	47,000	.00830	.00046	....	....	
48,000	48,000	.00860	.00030	....	....	
49,000	49,000	.00886	.00026	....	....	
50,000	50,000	.00902	.00016	.00666	.00158	
58,980	58,980	....	....	....	....	Ultimate strength.

Failed by triple flexure.

No. 1081.

Marks, $\overset{12\,\mathrm{M\,R_{7}\,T\,R_{1}}}{\mathrm{M\,T_{2}}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	....	....	
3,000	3,000	.00010	.00006	....	....	
4,000	4,000	.00014	.00004	....	....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00022	.00004	....	....	
7,000	7,000	.00028	.00006	....	....	
8,000	8,000	.00032	.00004	....	....	
9,000	9,000	.00038	.00006	....	....	
10,000	10,000	.00044	.00006	.00002	0.	
11,000	11,000	.00048	.00004	....	....	
12,000	12,000	.00054	.00006	....	....	
13,000	13,000	.00058	.00004	....	....	
14,000	14,000	.00064	.00006	....	....	
15,000	15,000	.00072	.00008	.00004	.00002	
16,000	16,000	.00076	.00004	....	....	
17,000	17,000	.00082	.00006	....	....	
18,000	18,000	.00086	.00004	....	....	
19,000	19,000	.00094	.00008	....	....	
20,000	20,000	.00100	.00006	.00008	.00004	
21,000	21,000	.00106	.00006	....	....	
22,000	22,000	.00114	.00008	....	....	
23,000	23,000	.00118	.00004	....	....	
24,000	24,000	.00122	.00004	....	....	
25,000	25,000	.00130	.00008	.00012	.00004	
26,000	26,000	.00140	.00010	....	....	
27,000	27,000	.00148	.00008	....	....	
28,000	28,000	.00154	.00006	....	....	
29,000	29,000	.00166	.00012	....	....	
30,000	30,000	.00178	.00012	.00034	.00022	
31,000	31,000	.00192	.00014	....	....	
32,000	32,000	.00208	.00016	....	....	
33,000	33,000	.00222	.00014	....	....	
34,000	34,000	.00250	.00028	....	....	
35,000	35,000	.00278	.00028	.00108	.00074	
36,000	36,000	.00300	.00022	....	....	
37,000	37,000	.00328	.00028	....	....	
38,000	38,000	.00368	.00040	....	....	
39,000	39,000	.00428	.00060	....	....	
40,000	40,000	.00488	.00060	.00288	.00180	
41,000	41,000	.00538	.00050	....	....	
42,000	42,000	.00570	.00032	....	....	
43,000	43,000	.00652	.00082	....	....	
44,000	44,000	.00730	.00078	....	....	
45,000	45,000	.00810	.00080	.00572	.00284	
46,000	46,000	.00910	.00100	....	....	
47,000	47,000	.00978	.00068	....	....	
48,000	48,000	.01060	.00082	....	....	
49,000	49,000	.01170	.00110	....	....	
50,000	50,000	.01300	.00130	.01008	.00436	
59,460	59,460	....	....	....	....	Ultimate strength.

Failed by triple flexure.

12-INCH B. L. RIFLED MORTARS.

Chemical composition of cast-iron bodies.

Tension test number.	No. of body.	Mark on specimen.	Carbon. Total.	Carbon. Graphitic.	Carbon. Combined.	Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
4549	1	B T_1	2.371	2.036	0.335	0.619	0.868	0.055	0.315	0.009
4550	1	M T_1	2.822	2.206	0.616	0.581	0.875	0.051	0.298	0.017
4555	2	B T_1	3.285	2.137	1.148	0.554	0.933	0.061	0.296	0.013
4556	2	M T_1	3.581	2.102	1.479	0.510	0.980	0.070	0.358	0.015
4527	2	B T_{11}	2.321	1.949	0.372	0.445	0.850	0.066	0.395	0.010
4528	2	M T_{11}	2.358	2.066	0.292	0.450	0.850	0.070	0.415	0.012
4559	3	B T_1	3.492	2.380	1.112	0.583	1.174	0.066	0.366	0.012
4560	3	M T_1	3.615	2.000	1.615	0.612	1.064	0.060	0.365	0.010
4529	4	B T_1	2.285	2.032	0.253	0.480	0.850	0.075	0.502	0.018
4530	4	M T_1	2.672	2.305	0.367	0.470	0.850	0.070	0.426	0.016
4531	5	B T_1	2.195	1.783	0.412	0.387	0.700	0.081	0.408	0.012
4532	5	M T_1	2.492	1.739	0.753	0.374	0.650	0.082	0.374	0.015
4573	6	B T_1	2.727	2.165	0.562	0.422	0.700	0.070	0.375	0.012
4574	6	M T_1	2.713	1.857	0.856	0.355	0.650	0.088	0.365	0.015
4575	7	B T_1	2.322	1.930	0.392	0.310	0.700	0.064	0.382	0.010
4576	7	M T_1	2.337	1.963	0.374	0.535	0.700	0.094	0.374	0.010
4578	8	B T_1	2.672	2.137	0.535	0.450	0.700	0.092	0.382	0.008
4579	8	M T_1	2.508	2.230	0.278	0.445	0.750	0.080	0.368	0.009
4580	9	B T_1	2.454	2.116	0.338	0.501	0.690	0.081	0.522	0.010
4581	9	M T_1	2.454	2.353	0.101	0.520	0.653	0.078	0.389	0.009
4584	10	B T_1	2.356	2.181	0.175	0.482	0.653	0.085	0.395	0.009
4585	10	M T_1	2.606	2.045	0.561	0.472	0.655	0.080	0.591	0.012
4594	10	B T_{11}	2.834	2.131	0.703	0.483	0.700	0.079	0.374	0.008
4595	10	M T_{11}	2.874	2.216	0.658	0.512	0.650	0.085	0.381	0.005
4618	10	B T_{11}	2.585	1.854	0.731	0.385	0.800	0.055	0.415	0.008
4619	10	M T_{21}	2.339	1.827	0.512	0.387	0.750	0.055	0.396	0.007
100	10	M T_{24} M O	2.091	1.816	0.275	0.400	0.840	0.058	0.302	0.006
4586	11	B T_1	2.821	2.157	0.664	0.542	0.653	0.084	0.350	0.009
4587	11	M T_1	2.806	2.052	0.754	0.540	0.671	0.082	0.365	0.006
4600	12	B T_{21}	2.394	2.056	0.338	0.470	0.700	0.063	0.439	0.008
4601	12	M T_{21}	2.884	2.001	0.883	0.465	0.700	0.075	0.378	0.006
4626	12	B T_{31}	2.577	2.127	0.450	0.305	0.770	0.045	0.463	0.005
4627	12	M T_{31}	2.577	2.102	0.475	0.315	0.750	0.047	0.420	0.006
110	12	M T_{34} M O	2.124	1.434	0.690	0.301	0.800	0.041	0.515	0.005
4596	13	B T_1	2.777	2.007	0.770	0.450	0.560	0.070	0.295	0.006
4597	13	M T_1	3.070	1.750	1.320	0.431	0.606	0.061	0.289	0.008
4660	13	B T_{11}	2.781	2.080	0.701	0.361	0.765	0.055	0.400	0.006
4670	13	B T_{11} Extra disk.	2.331	1.576	0.755	0.368	0.667	0.055	0.414	0.005
4661	13	M T_{11}	2.282	1.805	0.477	0.374	0.770	0.045	0.402	0.004
4598	14	B T_1	2.383	1.989	0.394	0.490	0.800	0.073	0.469	0.006
4599	14	M T_1	2.383	2.203	0.180	0.512	0.750	0.072	0.603	0.006
4666	14	B T_{11}	2.727	1.867	0.860	0.426	0.850	0.063	0.364	0.008
4667	14	M T_{11}	2.601	1.862	0.739	0.413	0.760	0.060	0.358	0.004
4604	15	B T_1	2.341	1.884	0.457	0.460	0.975	0.072	0.405	0.005
4605	15	M T_1	2.301	1.895	0.406	0.620	0.987	0.067	0.408	0.006
59	15	M T_4 MO	2.181	1.802	0.379	0.462	0.900	0.060	0.354	0.006
4668	15	B T_{11}	2.727	2.080	0.647	0.437	0.800	0.064	0.730	0.005
4669	15	M T_{11}	2.781	2.086	0.695	0.420	0.850	0.066	0.748	0.005
4606	16	B T_1	2.399	1.826	0.573	0.481	0.933	0.076	0.445	0.006
4607	16	M T_1	2.361	1.805	0.556	0.480	0.935	0.072	0.415	0.008
4671	16	B T_{11}	2.836	1.791	1.045	0.497	1.165	0.046	0.436	0.004
4672	16	M T_{11}	2.855	2.017	0.838	0.503	1.081	0.045	0.367	0.004
4610	17	B T_1	2.606	1.992	0.614	0.467	0.700	0.068	0.378	0.005
4611	17	M T_1	2.808	1.857	0.951	0.475	0.700	0.080	0.382	0.005
	18	B T_1	2.721	2.181	0.540	0.457	0.870	0.059	0.390	0.008
	18	M T_1	2.367	2.088	0.279	0.450	0.770	0.058	0.349	0.004

12-INCH B. L. RIFLED MORTARS.

Chemical composition of cast-iron bodies—Continued.

Tension test number.	No. of body.	Mark on specimen.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
			Total.	Graphitic.	Combined.					
4877	19	B T_1	2.252	1.903	0.349	0.432	0.882	0.050	0.380	0.010
4678	19	M T_1	2.268	1.919	0.349	0.428	0.884	0.040	0.369	0.006
4681	20	B T_1	2.275	1.919	0.356	0.437	1.004	0.044	0.460	0.011
4682	20	M T_1	2.222	1.786	0.436	0.440	0.846	0.046	0.368	0.012
4715	20	B T_{11}	2.366	1.914	0.452	0.348	0.874	0.075	0.407	0.010
4716	20	M T_{11}	2.473	1.892	0.581	0.374	0.658	0.070	0.391	0.010
4683	21	B T_1	2.424	1.936	0.488	0.445	0.620	0.060	0.403	0.006
4684	21	M T_1	2.637	1.966	0.671	0.441	0.800	0.098	0.411	0.008
4699	21	M T_1 .... Extra disk..	2.979	2.277	0.702	0.445	0.808	0.070	0.370	0.009
4749	21	B T_{11}	2.863	1.783	1.080	0.379	0.940	0.070	0.361	0.009
4750	21	M T_{11}	2.890	1.827	1.063	0.384	0.911	0.065	0.359	0.010
4688	22	B T_1	2.536	1.941	0.595	0.501	0.800	0.078	0.433	0.011
4689	22	M T_1	2.549	1.952	0.597	0.497	0.800	0.078	0.411	0.008
4753	22	B T_{11}	2.241	1.827	0.414	0.413	0.864	0.059	0.425	0.015
4754	22	M T_{11}	2.328	1.791	0.537	0.411	0.977	0.057	0.421	0.012
4693	23	B T_1	2.470	1.960	0.510	0.432	0.882	0.066	0.384	0.012
4694	23	M T^1	2.425	1.941	0.484	0.439	0.892	0.064	0.391	0.010
4755	23	B T_{11}	2.140	1.810	0.330	0.348	0.900	0.063	0.381	0.010
4756	23	M T_{11}	2.217	1.750	0.460	0.433	0.800	0.076	0.371	0.015
4697	24	B T_1	2.759	2.086	0.673	0.438	0.836	0.065	0.385	0.010
4698	24	M T_1	2.590	1.851	0.739	0.420	0.864	0.070	0.378	0.012
4709	25	B T_1	2.173	1.718	0.455	0.400	0.846	0.066	0.365	0.006
4710	25	M T_1	2.197	1.728	0.469	0.432	0.827	0.067	0.360	0.010
244	25	M T_4 M O ...	2.146	1.712	0.434	0.348	0.940	0.074	0.359	0.009
4719	26	B T_1	2.606	1.914	0.692	0.342	0.864	0.066	0.342	0.009
4720	26	M T_1	2.636	1.936	0.700	0.335	0.817	0.068	0,368	0.012
4739	27	B T_1	2.273	1.718	0.555	0.396	0.977	0.070	0.367	0.015
4740	27	M T_1	2.347	1.889	0.458	0.400	0.958	0.076	0.360	0.012

12-INCH B. L. RIFLED MORTARS.

Chemical composition of cast-iron bodies.

Tension test number.	No. of body.	Mark on specimen.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
			Total.	Graphitic.	Combined.					
4549	1	B T_1	2.371	2.036	0.335	0.619	0.868	0.055	0.315	0.009
4550	1	M T_1	2.822	2.206	0.616	0.581	0.875	0.051	0.298	0.017
4555	2	B T_1	3.285	2.137	1.148	0.554	0.933	0.061	0.296	0.013
4556	2	M T_1	3.581	2.102	1.479	0.510	0.980	0.070	0.358	0.015
4527	2	B T_{11}	2.821	1.949	0.872	0.445	0.850	0.066	0.395	0.010
4528	2	M T_{11}	2.358	2.066	0.292	0.450	0.850	0.070	0.415	0.012
4559	3	B T_1	3.492	2.380	1.112	0.583	1.174	0.066	0.366	0.012
4560	3	M T_1	3.615	2.000	1.615	0.612	1.064	0.060	0.365	0.010
4529	4	B T_1	2.285	2.032	0.253	0.480	0.850	0.075	0.502	0.018
4530	4	M T_1	2.672	2.305	0.367	0.470	0.850	0.070	0.426	0.016
4531	5	B T_1	2.195	1.783	0.412	0.387	0.700	0.081	0.408	0.012
4532	5	M T_1	2.492	1.739	0.753	0.374	0.650	0.082	0.374	0.015
4573	6	B T_1	2.727	2.165	0.562	0.422	0.700	0.070	0.375	0.012
4574	6	M T_1	2.713	1.857	0.856	0.355	0.650	0.088	0.365	0.015
4575	7	B T_1	2.322	1.930	0.392	0.810	0.700	0.064	0.382	0.010
4576	7	M T_1	2.337	1.963	0.374	0.535	0.700	0.094	0.374	0.010
4578	8	B T_1	2.672	2.137	0.535	0.450	0.700	0.092	0.382	0.008
4579	8	M T_1	2.508	2.230	0.278	0.445	0.750	0.080	0.368	0.009
4580	9	B T_1	2.454	2.116	0.338	0.501	0.690	0.081	0.522	0.010
4581	9	M T_1	2.454	2.353	0.101	0.520	0.653	0.078	0.389	0.009
4584	10	B T_1	2.356	2.181	0.175	0.482	0.653	0.085	0.395	0.009
4585	10	M T_1	2.606	2.045	0.561	0.472	0.655	0.080	0.591	0.012
4594	10	B T_{11}	2.834	2.131	0.703	0.483	0.700	0.079	0.374	0.008
4595	10	M T_{11}	2.874	2.216	0.658	0.512	0.650	0.085	0.381	0.005
4618	10	B T_{11}	2.585	1.854	0.731	0.385	0.800	0.055	0.415	0.008
4619	10	M T_{21}	2.339	1.827	0.512	0.387	0.750	0.055	0.396	0.007
100	10	M T_{24} M O	2.091	1.816	0.275	0.400	0.840	0.058	0.302	0.006
4586	11	B T_1	2.821	2.157	0.664	0.542	0.653	0.084	0.350	0.009
4587	11	M T_1	2.806	2.052	0.754	0.540	0.671	0.082	0.365	0.006
4600	12	B T_{21}	2.394	2.056	0.338	0.470	0.700	0.063	0.439	0.008
4601	12	M T_{21}	2.884	2.001	0.883	0.465	0.700	0.075	0.378	0.006
4626	12	B T_{31}	2.577	2.127	0.450	0.305	0.770	0.045	0.463	0.005
4627	12	M T_{31}	2.577	2.102	0.475	0.315	0.750	0.047	0.420	0.006
110	12	M T_{34} M O	2.124	1.434	0,690	0.301	0.800	0.041	0.515	0.005
4596	13	B T_1	2.777	2.007	0.770	0.450	0.560	0.070	0.295	0.006
4597	13	M T_1	3.070	1.750	1.320	0.431	0.606	0.061	0.289	0.008
4660	13	B T_{11}	2.781	2.080	0.701	0.361	0.765	0.055	0.400	0.006
4670	13	B T_{11} Extra disk.	2.331	1.576	0.755	0.368	0.667	0.055	0.414	0.005
4661	13	M T_{11}	2.282	1.805	0.477	0.374	0.770	0.045	0.402	0.004
4598	14	B T_1	2.383	1.989	0.394	0.490	0.800	0.073	0.469	0.006
4599	14	M T_1	2.383	2.203	0.180	0.512	0.750	0.072	0.603	0.006
4666	14	B T_{11}	2.727	1.867	0.860	0.426	0.850	0.063	0.364	0.008
4667	14	M T_{11}	2.601	1.862	0.739	0.413	0.760	0.060	0.358	0.004
4604	15	B T_1	2.341	1.884	0.457	0.460	0.975	0.072	0.405	0.005
4605	15	M T_1	2.301	1.895	0.406	0.620	0.987	0.067	0.408	0.006
59	15	M T_4 MO	2.181	1.802	0.379	0.462	0.900	0.060	0.354	0.006
4668	15	B T_{11}	2.727	2.080	0.647	0.437	0.800	0.064	0.730	0.005
4669	15	M T_{11}	2.781	2.086	0.695	0.420	0.850	0.066	0.748	0.005
4606	16	B T_1	2.399	1.826	0.573	0.481	0.933	0.076	0.445	0.006
4607	16	M T_1	2.361	1.805	0.556	0.480	0.935	0.072	0.415	0.008
4671	16	B T_{11}	2.836	1.791	1.045	0.497	1.165	0.046	0.436	0.004
4672	16	M T_{11}	2.855	2.017	0.838	0.503	1.081	0.045	0.367	0.004
4610	17	B T_1	2.606	1.992	0.614	0.467	0.700	0.068	0.378	0.005
4611	17	M T_1	2.808	1.857	0.951	0.475	0.700	0.080	0.382	0.005
4612	18	B T_1	2.721	2.181	0.540	0.457	0.870	0.059	0.390	0.006
4613	18	M T_1	2.367	2.088	0.279	0.450	0.770	0.058	0.349	0.004

12-INCH B. L. RIFLED MORTARS.

Chemical composition of cast-iron bodies—Continued.

Tension test number.	No. of body.	Mark on specimen.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
			Total.	Graphitic.	Combined.					
4877	19	B T_{I}	2.252	1.903	0.349	0.432	0.882	0.050	0.380	0.010
4678	19	M T_{I}	2.268	1.919	0.349	0.428	0.884	0.040	0.369	0.006
4681	20	B T_{I}	2.275	1.919	0.356	0.437	1.004	0.044	0.460	0.011
4682	20	M T_{I}	2.222	1.786	0.436	0.440	0.846	0.046	0.368	0.012
4715	20	B T_{II}	2.366	1.914	0.452	0.348	0.874	0.075	0.407	0.010
4716	20	M T_{II}	2.473	1.892	0.581	0.374	0.658	0.070	0.391	0.010
4683	21	B T_{I}	2.424	1.936	0.488	0.445	0.620	0.060	0.403	0.006
4684	21	M T_{I}	2.637	1.966	0.671	0.441	0.800	0.098	0.411	0.008
4699	21	M T_{I} Extra disk	2.979	2.277	0.702	0.445	0.808	0.070	0.370	0.009
4749	21	B T_{II}	2.863	1.783	1.080	0.379	0.940	0.070	0.361	0.009
4750	21	M T_{II}	2.890	1.827	1.063	0.384	0.911	0.065	0.359	0.010
4688	22	B T_{I}	2.536	1.941	0.595	0.501	0.800	0.078	0.433	0.011
4689	22	M T_{I}	2.549	1.952	0.597	0.497	0.800	0.078	0.411	0.008
4753	22	B T_{II}	2.241	1.827	0.414	0.413	0.864	0.059	0.425	0.015
4754	22	M T_{II}	2.328	1.791	0.537	0.411	0.977	0.057	0.421	0.012
4693	23	B T_{I}	2.470	1.960	0.510	0.432	0.882	0.066	0.384	0.012
4694	23	M T^{I}	2.425	1.941	0.484	0.439	0.892	0.064	0.391	0.010
4755	23	B T_{II}	2.140	1.810	0.330	0.348	0.900	0.063	0.381	0.010
4756	23	M T_{II}	2.217	1.750	0.460	0.433	0.800	0.076	0.371	0.015
4697	24	B T_{I}	2.759	2.086	0.673	0.438	0.836	0.065	0.385	0.010
4698	24	M T_{I}	2.590	1.851	0.739	0.420	0.864	0.070	0.378	0.012
4709	25	B T_{I}	2.173	1.718	0.455	0.400	0.846	0.066	0.365	0.006
4710	25	M T_{I}	2.197	1.728	0.469	0.432	0.827	0.067	0.360	0.010
244	25	M T_{4} M O	2.146	1.712	0.434	0.348	0.940	0.074	0.359	0.009
4719	26	B T_{I}	2.606	1.914	0.692	0.342	0.864	0.066	0.342	0.009
4720	26	M T_{I}	2.636	1.936	0.700	0.335	0.817	0.068	0,368	0.012
4739	27	B T_{I}	2.273	1.718	0.555	0.396	0.977	0.070	0.367	0.015
4740	27	M T_{I}	2.347	1.889	0.458	0.400	0.958	0.076	0.360	0.012

12-INCH B. L. RIFLED MORTARS.

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. inch.*	*Pounds.*				
4527	2	11	Breech	Inside	23	1.00	25,000	Uniform granular			Second casting.
4528	2	11	Muzzle	do	23	1.00	30,780	do			
4564	2	13	Breech	do	Grooved	1.00	28,060	do	7.3117	15.28	
4565	2	14	do	Outside	do	1.00	32,380	do	7.3142	17.35	
4566	2	15	do	do	do	1.00	32,240	do	7.3113	15.20	
4567	2	16	do	Inside	do	1.00	28,890	do			
4568	2	17	do	do	do	1.00	29,890	do			
4569	2	18	do	Outside	do	1.00	30,010	do			
4570	2	19	do	do	do	1.00	30,300	do			
4571	2	13	Muzzle	Inside	do	1.00	32,160	do	7.3102	17.17	
4572	2	14	do	Outside	do	1.00	30,280	do	7.3102	15.28	
4573	2	15	do	do	do	1.00	32,970	do	7.3054	16.48	
4529	4	1	Breech	Inside	23	1.00	24,930	do			
4530	4	1	Muzzle	do	23	1.00	26,410	do			
6001	4	3	Breech	do	Grooved	1.00	29,010	do	7.3306	16.73	
6002	4	4	do	Outside	do	1.00	30,890	do	7.3320	16.07	
6003	4	5	do	do	do	1.00	30,980	do	7.3260	16.15	
6004	4	6	do	Inside	do	1.00	31,430	do			
6005	4	7	do	do	do	1.00	29,420	do			
6006	4	8	do	Outside	do	1.00	30,410	do			
6007	4	9	do	do	do	1.00	31,900	do			
6008	4	3	Muzzle	Inside	do	1.00	29,810	do	7.2979	15.28	
6009	4	4	do	Outside	do	1.00	31,770	do	7.3298	16.56	
6010	4	5	do	do	do	1.00	32,150	do	7.3021	15.59	
4531	5	1	Breech	Inside	23	1.00	25,000	Granular, mottled			
4532	5	1	Muzzle	do	23	1.00	27,320	do			
6012	5	3	Breech	do	Grooved	1.00	29,150	do	7.3422	15.28	
6013	5	4	do	Outside	do	1.00	30,200	do	7.3473	15.99	
6014	5	5	do	do	do	1.00	32,720	do	7.3443	15.83	
6015	5	6	do	Inside	do	1.00	29,690	do			
6016	5	7	do	do	do	1.00	28,650	do			
6017	5	8	do	Outside	do	1.00	30,010	do			
6018	5	9	do	do	do	1.00	29,510	do			
6019	5	3	Muzzle	Inside	do	1.00	33,380	do	7.3409	17.62	
6020	5	4	do	Outside	do	1.00	29,990	do	7.3466	17.99	
6021	5	5	do	do	do	1.00	33,010	do	7.3341	15.83	

4573	6	1	Breech	Inside	23	1.00	25,590	Uniform granular		
4574	6	1	Muzzle	...do	23	1.00	28,300	......do		
6022	6	3	Breech	...do	Grooved	1.00	29,510	......do	7.3278	15.43
6023	6	4	...do	Outside	...do	1.00	30,470	......do	7.3274	15.43
6024	6	5	...do	...do	...do	1.00	31,980	......do	7.3226	15.36
6025	6	6	...do	Inside	...do	1.00	30,450	......do		
6026	6	7	...do	...do	...do	1.00	29,660	......do		
6027	6	8	...do	Outside	...do	1.00	30,600	......do		
6028	6	9	...do	...do	...do	1.00	31,350	......do		
6029	6	3	Muzzle	Inside	...do	1.00	30,130	......do	7.3290	14.06
6030	6	4	...do	Outside	...do	1.00	30,780	......do	7.3321	14.61
6031	6	5	...do	...do	...do	1.00	30,670	......do	7.3127	14.06
4575	7	1	Breech	Inside	23	1.00	30,590	Medium fine granular		
4576	7	1	Muzzle	...do	23	1.00	27,640	Granular mottled		
6036	7	3	Breech	...do	Grooved	1.00	34,020	Medium fine granular	7.3240	16.47
6037	7	4	...do	Outside	...do	1.00	32,690	......do	7.3374	15.99
6038	7	5	...do	...do	...do	1.00	31,650	......do	7.3141	16.31
6039	7	6	...do	Inside	...do	1.00	34,180	......do		
6040	7	7	...do	...do	...do	1.00	36,880	......do	7.3488	16.73
6041	7	8	...do	Outside	...do	1.00	33,460	......do		
6042	7	9	...do	...do	...do	1.00	32,030	......do		
6043	7	3	Muzzle	Inside	...do	1.00	29,490	......do	7.3167	15.18
6044	7	4	...do	Outside	...do	1.00	28,990	......do	7.3219	15.28
6045	7	5	...do	...do	...do	1.00	30,350	......do	7.3048	14.98
4578	8	1	Breech	Inside	23	1.00	28,040	Uniform granular		
4579	8	1	Muzzle	...do	23	1.00	25,690	......do		
6047	8	3	Breech	...do	Grooved	1.00	30,040	......do	7.3149	15.13
6048	8	4	...do	Outside	...do	1.00	31,150	......do	7.3115	14.91
6049	8	5	...do	...do	...do	1.00	30,980	......do	7.3051	14.83
6050	8	6	...do	Inside	...do	1.00	30,200	......do		
6051	8	7	...do	...do	...do	1.00	30,550	......do		
6052	8	8	...do	Outside	...do	1.00	31,490	......do		
6053	8	9	...do	...do	...do	1.00	31,420	......do		
6054	8	3	Muzzle	Inside	...do	1.00	29,270	......do	7.3008	14.91
6055	8	4	...do	Outside	...do	1.00	30,790	......do	7.3239	15.67
6056	8	5	...do	...do	...do	1.00	31,100	......do	7.2934	14.83
4580	9	1	Breech	Inside	23	1.00	28,030	......do		
4581	9	1	Muzzle	...do	23	1.00	26,980	......do		
6057	9	3	Breech	...do	Grooved	1.00	29,870	......do	7.3219	15.91
6058	9	4	...do	Outside	...do	1.00	28,790	......do	7.3228	14.98
6059	9	5	...do	...do	...do	1.00	32,020	......do	7.3204	15.20
6060	9	6	...do	Inside	...do	1.00	30,450	......do		
6061	9	7	...do	...do	...do	1.00	29,030	......do		
6062	9	8	...do	Outside	...do	1.00	29,920	......do		
6063	9	9	...do	...do	...do	1.00	30,040	......do		
6064	9	3	Muzzle	Inside	...do	1.00	28,150	......do	7.2868	14.90
6065	9	4	...do	Outside	...do	1.00	34,430	Uniform fine granular	7.3322	15.83
6066	9	5	...do	...do	...do	1.00	27,710	Uniform granular	7.2565	13.08

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Number of—		Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
	Mortar.	Specimen.									
					Inches.	*Sq. inch.*	*Pounds.*				
4584	10	1	Breech	Inside	23	1.00	24,980	Uniform granular			
4585	10	1	Muzzle	do	23	1.00	27,320	do			
6067	10	3	Breech	do	Grooved	1.00	28,610	do	7.3189	14.19	
6068	10	4	do	Outside	do	1.00	29,320	do	7.3195	14.76	
6069	10	5	do	do	do	1.00	29,890	do	7.3123	14.98	
6070	10	6	do	Inside	do	1.00	31,010	do			
6071	10	7	do	do	do	1.00	28,020	do			
6072	10	8	do	Outside	do	1.00	30,250	do			
6073	10	9	do	do	do	1.00	30,020	do			
6074	10	3	Muzzle	Inside	do	1.00	30,740	do	7.3195	14.69	
6075	10	4	do	Outside	do	1.00	30,070	do	7.3205	15.75	
6076	10	5	do	do	do	1.00	30,710	do	7.3033	15.20	
4594	10	11	Breech	do	23	1.00	25,000	40 per cent uniform granular, 60 per cent coarse granular, with dark spangles			Second casting.
4595	10	11	Muzzle	do	23	1.00	26,940	Granular mottled			
11	10	13	Breech	Inside	Grooved	1.00	34,520	Uniform granular	7.3144	15.51	
12	10	14	do	Outside	do	1.00	28,020	do	7.3336	15.75	
13	10	15	do	do	do	1.00	32,260	do	7.3234	15.21	
14	10	16	do	Inside	do	1.00	23,980	Granular, with coarse dark spangles			
15	10	17	do	do	do	1.00	29,950	Uniform granular			
16	10	18	do	Outside	do	1.00	33,980	do			
17	10	19	do	do	do	1.00	31,770	do			
18	10	13	Muzzle	Inside	do	1.00	31,340	do	7.3297	15.43	
19	10	14	do	Outside	do	1.00	29,200	do	7.3346	15.91	
20	10	15	do	do	do	1.00	29,050	do	7.3095	15.51	
4618	10	31	Breech	do	23	1.00	29,910	Granular			Fourth casting.
4619	10	31	Muzzle	do	23	1.00	28,140	do			
92	10	33	Breech	Inside	Grooved	1.00	31,040	do	7.3283	17.08	
93	10	34	do	Outside	do	1.00	30,750	do	7.3301	16.73	
94	10	35	do	do	do	1.00	31,120	do	7.3268	16.81	
95	10	36	do	Inside	do	1.00	30,970	do			
96	10	37	do	do	do	1.00	30,200	do			
97	10	38	do	Outside	do	1.00	31,610	do			
98	10	39	do	do	do	1.00	32,620	do			
99	10	33	Muzzle	Inside	do	1.00	33,870	do	7.3266	15.91	
100	10	34	do	Outside	do	1.00	37,990	do	7.3048	17.62	
101	10	35	do	do	do	1.00	30,850	do	7.2964	16.81	
4586	11	1	Breech	Inside	23	1.00	29,340	Uniform granular			
4587	11	1	Muzzle	do	23	1.00	27,590	do			

1	11	3	Breech....	Inside....	Grooved	1.00	28,710	......do	7.3394	15.35	
2	11	4	...do	Outside...	...do....	1.00	30,500	......do	7.3454	14.90	
3	11	5	...do	...do	...do....	1.00	30,620	......do	7.3290	15.75	
4	11	6	...do	Inside....	...do....	1.00	30,830	......do	....	....	
5	11	7	...do	...do	...do....	1.00	28,310	......do	....	....	
6	11	8	...do	Outside...	...do....	1.00	31,570	......do	....	....	
7	11	9	...do	...do	...do....	1.00	30,560	......do	....	....	
8	11	3	Muzzle...	Inside....	...do....	1.00	29,650	......do	7.3158	15.28	
9	11	4	...do	Outside...	...do....	1.00	35,070	......do	7.3460	15.91	
10	11	5	...do	...do	...do....	1.00	30,690	......do	7.3315	15.75	
4600	12	21	Breech....	Inside....	23	1.00	28,530	......do	....	....	Third casting.
4601	12	21	Muzzle...	...do	23	1.00	28,020	......do	....	....	
41	12	23	Breech....	...do	Grooved	1.00	28,560	......do	7.3264	15.75	
42	12	24	...do	Outside...	...do....	1.00	29,870	......do	7.3296	15.51	
43	12	25	...do	...do	...do....	1.00	31,350	......do	7.3262	15.67	
44	12	26	...do	Inside....	...do....	1.00	29,460	......do	....	....	
45	12	27	...do	...do	...do....	1.00	29,040	......do	....	....	
46	12	28	...do	Outside...	...do....	1.00	29,500	......do	....	....	
47	12	29	...do	...do	...do....	1.00	29,910	......do	....	....	
48	12	23	Muzzle...	Inside....	...do....	1.00	27,850	......do	7.2901	14.54	
49	12	24	...do	Outside...	...do....	1.00	32,580	......do	7.3491	17.53	
50	12	25	...do	...do	...do....	1.00	29,410	......do	7.2955	15.51	
4626	12	31	Breech...	Inside....	23	1.00	29,890	Granular	....	....	Fourth casting.
4627	12	31	Muzzle...	...do	23	1.00	29,250	......do	....	....	
102	12	33	Breech...	...do	Grooved	1.00	30,120	......do	7.3425	17.62	
103	12	34	...do	Outside...	...do....	1.00	31,010	......do	7.3417	17.90	
104	12	35	...do	...do	...do....	1.00	30,100	......do	7.3291	17.44	
105	12	36	...do	Inside....	..do....	1.00	29,670	......do	....	....	
106	12	37	...do	...do	...do....	1.00	30,760	......do	....	....	
107	12	38	...do	Outside...	...do....	1.00	30,990	......do	....	....	
108	12	39	...do	...do	...do....	1.00	31,620	......do	....	....	
109	12	33	Muzzle...	Inside....	...do....	1.00	31,040	......do	7.3228	17.44	
110	12	34	...do	Outside...	...do....	1.00	37,640	Fine granular	7.3808	17.99	
111	12	35	...do	...do	...do....	1.00	31,000	Granular	7.3428	17.62	
4596	13	1	Breech...	Inside....	23	1.00	25,000	Uniform granular	....	....	
4597	13	1	Muzzle...	...do	23	1.00	20,840	Granular, with coarse dark spangles	....	....	
21	13	3	Breech...	...do	Grooved	1.00	30,590	Uniform granular	7.3461	16.56	
22	13	4	...do	Outside...	...do....	1.00	36,270	......do	7.3439	16.23	
23	13	5	...do	...do	...do....	1.00	33,110	......do	7.3307	15.75	
24	13	6	...do	Inside....	...do....	1.00	32,040	......do	....	....	
25	13	7	...do	...do	...do....	1.00	32,720	......do	....	....	
26	13	8	...do	Outside...	...do....	1.00	32,390	......do	....	....	
27	13	9	...do	...do	...do....	1.00	33,020	......do	....	....	
28	13	3	Muzzle...	Inside....	...do....	1.00	29,030	......do	7.3338	15.91	
29	13	4	...do	Outside...	...do....	1.00	28,060	......do	7.3394	16.07	
30	13	5	...do	...do	...do....	1.00	33,180	......do	7.3233	15.83	
4660	13	11	Breech...	Inside....	23	1.00	26,620	Granular	....	....	Second casting.
4661	13	11	Muzzle...	...do	23	1.00	28,450	Granular, coarse stellar arrangement on one side	....	....	

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. inch.*	*Pounds.*				
112	13	13	Breech	Inside	Grooved	1.00	29,040	Granular	7.3356	17.08	Second casting.
113	13	14	do	Outside	do	1.00	29,030	do	7.3393	17.53	
114	13	15	do	do	do	1.00	31,390	do	7.3372	16.82	
115	13	16	do	Inside	do	1.00	29,770	do			
116	13	17	do	do	do	1.00	30,240	do			
117	13	18	do	Outside	do	1.00	29,540	do			
118	13	19	do	do	do	1.00	26,750	Granular, with coarse stellar structure	7.2998	17.44	
119	13	13	Muzzle	Inside	do	1.00	28,100	Granular	7.3192	18.38	
120	13	14	do	Outside	do	1.00	33,500	do	7.3578	19.81	
121	13	15	do	do	do	1.00	29,900	do	7.3323	17.99	
4670	13	11	Breech	Inside	23	1.00	28,100	do			Extra disk from second casting.
142	13	13	do	do	Grooved	1.00	31,160	do	7.3361	17.17	
143	13	14	do	Outside	do	1.00	31,030	do	7.3359	16.81	
144	13	15	do	do	do	1.00	32,990	do	7.3395	17.62	
145	13	16	do	Inside	do	1.00	34,210	do			
146	13	17	do	do	do	1.00	29,920	do			
147	13	18	do	Outside	do	1.00	30,010	do			
148	13	19	do	do	do	1.00	30,550	do			
4598	14	1	do	Inside	23	1.00	28,160	Uniform granular			
4599	14	1	Muzzle	do	23	1.00	25,020	Granular			
31	14	3	Breech	do	Grooved	1.00	30,280	do	7.3151	14.90	
32	14	4	do	Outside	do	1.00	27,100	do	7.3157	13.99	
33	14	5	do	do	do	1.00	29,340	do	7.3105	14.26	
34	14	6	do	Inside	do	1.00	29,120	do			
35	14	7	do	do	do	1.00	29,010	do			
36	14	8	do	Outside	do	1.00	29,720	do			
37	14	9	do	do	do	1.00	30,400	do			
38	14	3	Muzzle	Inside	do	1.00	29,680	do	7,2991	13.27	
39	14	4	do	Outside	do	1.00	29,870	do	7.3139	13.99	
40	14	5	do	do	do	1.00	30,820	do	7 2949	13.20	
4666	14	11	Breech	Inside	23	1.00	26,120	do			Second casting.
4667	14	11	Muzzle	do	23	1.00	29,100	do			
122	14	13	Breech	do	Grooved	1.00	30,720	do	7.3403	16.90	
123	14	14	do	Outside	do	1.00	29,990	do	7.3410	15.99	
124	14	15	do	do	do	1.00	32,410	do	7.3426	15.43	
125	14	16	do	Inside	do	1.00	31,800	do			
126	14	17	do	do	do	1.00	29,890	do			
127	14	18	do	Outside	do	1.00	28,910	do			

128	14	19	...do	...do	...do	1.00	31,600	......do			Second casting.
129	14	13	Muzzle	Inside	...do	1.00	29,350	......do	7.3230	16.07	
130	14	14	...do	Outside	...do	1.00	31,010	......do	7.3384	16.64	
131	14	15	...do	...do	...do	1.00	32,030	......do	7.3275	16.07	
4604	15	1	Breech	Inside	23	1.00	25,690	Granular, with coarse stellar arrangement			
4605	15	1	Muzzle	...do	23	1.00	25,000	Uniform granular			
51	15	3	Breech	...do	Grooved	1.00	28,640	Granular	7.3055	13.46	
52	15	4	...do	Outside	...do	1.00	27,710	......do	7.3111	13.99	
53	15	5	...do	...do	...do	1.00	30,980	......do	7.3087	14.19	
54	15	6	...do	Inside	...do	1.00	27,620	......do			
55	15	7	...do	...do	...do	1.00	29,100	......do			
56	15	8	...do	Outside	...do	1.00	29,490	......do			
57	15	9	...do	...do	...do	1.00	29,710	......do			
58	15	3	Muzzle	Inside	...do	1.00	28,980	......do	7.2844	13.99	
59	15	4	...do	Outside	...do	1.00	37,240	Fine granular, granitic appearance	7.3408	15.51	
60	15	5	...do	...do	...do	1.00	29,150	Granular	7.2602	11.98	
4668	15	11	Breech	Inside	23	1.00	27,120	......do			Second casting.
4669	15	11	Muzzle	...do	23	1.00	29,050	......do			
132	15	13	Breech	...do	Grooved	1.00	29,520	......do	7.3386	16.65	
133	15	14	...do	Outside	...do	1.00	29,580	......do	7.3411	16.56	
134	15	15	...do	...do	...do	1.00	31,980	......do	7.3410	16.56	
135	15	16	...do	Inside	...do	1.00	32,100	......do			
136	15	17	...do	...do	...do	1.00	31,650	......do			
137	15	18	...do	Outside	...do	1.00	31,460	......do			
138	15	19	...do	...do	...do	1.00	30,990	......do			
139	15	13	Muzzle	Inside	...do	1.00	29,940	......do	7.2976	16.31	
140	15	14	....do	Outside	...do	1.00	31,830	Granular, in part fine	7.3471	16.99	
141	15	15	....do	....do	...do	1.00	30,740	......do	7.3045	15.99	
4606	16	1	Breech	Inside	23	1.00	23,380	Uniform granular			
4607	16	1	Muzzle	...do	23	1.00	29,710	......do			
61	16	3	Breech	....do	Grooved	1.00	29,630	Granular	7.3369	14.54	
62	16	4	...do	Outside	...do	1.00	29,410	......do	7.3367	14.19	
63	16	5	...do	....do	...do	1.00	30,470	......do	7.3347	14.76	
64	16	6	...do	Inside	...do	1.00	29,210	......do			
65	16	7	...do	....do	...do	1.00	27,880	......do			
66	16	8	...do	Outside	...do	1.00	29,310	......do			
67	16	9	...do	....do	...do	1.00	28,260	......do			
68	16	3	Muzzle	Inside	...do	1.00	32,060	......do	7.3355	14.54	
69	16	4	...do	Outside	...do	1.00	33,200	......do	7.3497	15.99	
70	16	5	...do	....do	...do	1.00	33,010	......do	7.3122	14.47	
4671	16	11	Breech	Inside	23	1.00	26,780	......do			Second casting.
4672	16	11	Muzzle	....do	23	1.00	27,040	......do			
149	16	13	Breech	....do	Grooved	1.00	29,320	......do	7.3454	17.35	
150	16	14	...do	Outside	...do	1.00	29,670	......do	7.3441	16.56	
151	16	15	...do	....do	...do	1.00	30,200	......do	7.3393	16.82	
152	16	16	...do	Inside	...do	1.00	29,020	......do			
153	16	17	...do	....do	...do	1.00	30,410	......do			
154	16	18	...do	Outside	...do	1.00	31,580	......do			

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. inch.*	*Pounds.*				
155	16	19	Breech	Outside	Grooved	1.00	30,010	Granular			Second casting.
156	16	13	Muzzle	Inside	do	1.00	31,920	do	7.3332	17.35	
157	16	14	do	Outside	do	1.00	33,820	Fine granular	7.3848	17.71	
158	16	15	do	do	do	1.00	29,360	Granular	7.3150	17.90	
4610	17	1	Breech	Inside	23	1.00	26,820	do			
4611	17	1	Muzzle	do	23	1.00	28,890	do			
71	17	3	Breech	do	Grooved	1.00	29,040	do	7.3376	16.73	
72	17	4	do	Outside	do	1.00	30,610	do	7.3414	16.31	
73	17	5	do	do	do	1.00	32,590	do	7.3346	16.82	
74	17	6	do	Inside	do	1.00	28,330	do			
75	17	7	do	do	do	1.00	30,370	do			
76	17	8	do	Outside	do	1.00	30,710	do			
77	17	9	do	do	do	1.00	30,280	do			
78	17	3	Muzzle	Inside	do	1.00	28,420	do	7.3132	17.17	
79	17	4	do	Outside	do	1.00	35,790	Fine granular	7.3557	17.81	
80	17	5	do	do	do	1.00	30,530	Granular	7.3137	17.08	
4612	18	1	Breech	Inside	23	1.00	27,660	do			
4613	18	1	Muzzle	do	23	1.00	29,610	do			
81	18	3	Breech	do	Grooved	1.00	29,680	do	7.3362	16.39	
82	18	4	do	Outside	do	1.00	30,020	do	7.3393	16.90	
83	18	5	do	do	do	1.00	31,110	do	7.3331	16.81	
84	18	6	do	Inside	do	1.00	30,040	do			
85	18	7	do	do	do	1.00	28,930	do			
86	18	8	do	Outside	do	1.00	30,[illegible]50	do			
87	18	9	do	do	do	1.00	30,970	do			
88	18	3	Muzzle	Inside	do	1.00	30,760	do	7.3242	16.90	
89	18	4	do	Outside	do	1.00	32,480	do	7.3366	17.90	
90	18	5	do	do	do	1.00	30,360	do	7.2820	16.47	
4677	19	1	Breech	Inside	23	1.00	26,610	do			
4678	19	1	Muzzle	do	23	1.00	26,010	do			
159	19	3	Breech	do	Grooved	1.00	29,890	do	7.3260	16.31	
160	19	4	do	Outside	do	1.00	30,500	do	7.3267	16.31	
161	19	5	do	do	do	1.00	31,160	do	7.3232	15.75	
162	19	6	do	Inside	do	1.00	32,020	do			
163	19	7	do	do	do	1.00	29,870	do			
164	19	8	do	Outside	do	1.00	31,050	do			
165	19	9	do	do	do	1.00	30,620	do			
166	19	9x	do	do	do	1.00	30,890	do			
167	19	9xx	do	do	do	1.00	31,980	do			

168	19	3	Muzzle	Inside	do	1.00	29,400	do	7.3067	15.51	
169	19	4	do	Outside	do	1.00	29,770	do	7.3054	15.75	
170	19	5	do	do	do	1.00	31,710	do	7.3230	16.48	
4681	20	1	Breech	Inside	23	1.00	26,220	do			
4682	20	1	Muzzle	do	23	1.00	29,440	do			
171	20	3	Breech	do	Grooved	1.00	29,480	do	7.3397	16.48	
172	20	4	do	Outside	do	1.00	28,120	do	7.3429	16.73	
173	20	5	do	do	do	1.00	30,470	do	7.3421	16.73	
174	20	6	do	Inside	do	1.00	29,720	do			
175	20	7	do	do	do	1.00	29,170	do			
176	20	8	do	Outside	do	1.00	29,100	do			
177	20	9	do	do	do	1.00	29,720	do			
178	20	9x	do	do	do	1.00	29,350	do			
179	20	9xx	do	do	do	1.00	29,120	do			
180	20	3	Muzzle	Inside	do	1.00	31,030	Fine granular	7.3435	17.08	
181	20	4	do	Outside	do	1.00	33,060	do	7.3500	16.73	
182	20	5	do	do	do	1.00	30,320	do	7.3221	15.83	
4715	20	11	Breech	Inside	23	1.00	25,710	Granular			Second casting.
4716	20	11	Muzzle	do	23	1.00	28,320	do			
246	20	13	Breech	do	Grooved	1.00	29,820	do	7.3586	15.28	
247	20	14	do	Outside	do	1.00	30,510	do	7.3629	15.91	
248	20	15	do	do	do	1.00	33,200	do	7.3636	16.31	
249	20	16	do	Inside	do	1.00	31,060	do			
250	20	17	do	do	do	1.00	30,420	do			
251	20	18	do	Outside	do	1.00	30,250	do			
252	20	19	do	do	do	1.00	30,110	do			
253	20	19x	do	do	do	1.00	30,990	do			
254	20	19xx	do	do	do	1.00	30,740	do			
255	20	13	Muzzle	Inside	do	1.00	30,680	do	7.3543	16.73	
256	20	14	do	Outside	do	1.00	35,570	Fine granular	7.3793	17.17	
257	20	15	do	do	do	1.00	32,360	Granular	7.3372	16.15	
4683	21	1	Breech	Inside	23	1.00	28,640	do			
4684	21	1	Muzzle	do	23	1.00	29,140	do			
183	21	3	Breech	do	Grooved	1.00	30,020	do	7.3326	15.67	
184	21	4	do	Outside	do	1.00	30,710	do	7.3296	15.50	
185	21	5	do	do	do	1.00	30,770	do	7.3340	15.59	
186	21	6	do	Inside	do	1.00	29,300	do			
187	21	7	do	do	do	1.00	29,910	do			
188	21	8	do	Outside	do	1.00	29,960	do			
189	21	9	do	do	do	1.00	31,250	do			
190	21	9x	do	do	do	1.00	31,040	do			
191	21	9xx	do	do	do	1.00	30,460	do			
192	21	3	Muzzle	Inside	do	1.00	28,200	do	7.3204	15.05	
193	21	4	do	Outside	do	1.00	27,120	do	7.3216	15.67	
194	21	5	do	do	do	1.00	30,980	do	7.3035	14.54	
4699	21	1	do	Inside	23	1.00	27,870	do			Extra disk.
231	21	3	do	do	Grooved	1.00	27,870	do	7.2861	13.14	
232	21	4	do	Outside	do	1.00	30,390	do	7.3289	13.66	
233	21	5	do	do	do	1.00	29,020	do	7.3091	13.08	

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. inch.*	*Pounds.*				
4749	21	11	Breech	Inside	23	1.00	25,320	Granular			Second casting.
4750	21	11	Muzzle	do	23	1.00	28,650	do			
282	21	13	Breech	do	Grooved	1.00	28,300	do	7.3494	17.44	
283	21	14	do	Outside	do	1.00	27,610	do	7.3479	16.82	
284	21	15	do	do	do	1.00	30,290	do	7.3531	17.17	
285	21	16	do	Inside	do	1.00	29,550	do			
286	21	17	do	do	do	1.00	28,710	do			
287	21	18	do	Outside	do	1.00	28,020	do			
288	21	19	do	do	do	1.00	29,570	do			
289	21	19x	do	do	do	1.00	28,510	do			
290	21	19x x	do	do	do	1.00	28,080	do			
291	21	13	Muzzle	Inside	do	1.00	31,250	do	7.3283	16.73	
292	21	14	do	Outside	do	1.00	34,740	do	7.3697	17.62	
293	21	15	do	do	do	1.00	30,430	do	7.3473	17.26	
4688	22	1	Breech	Inside	23	1.00	27,690	do			
4689	22	1	Muzzle	do	23	1.00	28,720	do			
195	22	3	Breech	do	Grooved	1.00	28,520	do	7.3315	13.33	
196	22	4	do	Outside	do	1.00	30,300	do	7.3305	15.43	
197	22	5	do	do	do	1.00	31,740	do	7.3321	12.84	
198	22	6	do	Inside	do	1.00	31,160	do			
199	22	7	do	do	do	1.00	30,700	do			
200	22	8	do	Outside	do	1.00	28,510	do			
201	22	9	do	do	do	1.00	30,450	do			
202	22	9x	do	do	do	1.00	29,430	do			
203	22	9xx	do	do	do	1.00	30,120	do			
204	22	3	Muzzle	Inside	do	1.00	29,410	do	7.3456	13.20	
205	22	4	do	Outside	do	1.00	31,900	do	7.3492	13.08	
206	22	5	do	do	do	1.00	28,520	do	7.3130	12.60	
4753	22	11	Breech	Inside	23	1.00	24,000	Granular with coarse spangles			Second casting.
4754	22	11	Muzzle	do	23	1.00	28,150	Granular			
294	22	13	Breech	do	Grooved	1.00	30,680	do	7.3392	16.73	
295	22	14	do	Outside	do	1.00	30,990	do	7.3397	17.08	
296	22	15	do	do	do	1.00	31,070	do	7.3411	16.90	
297	22	16	do	Inside	do	1.00	31,530	do			
298	22	17	do	do	do	1.00	29,990	do			
299	22	18	do	Outside	do	1.00	30,010	do			
300	22	19	do	do	do	1.00	29,720	do			
301	22	19x	do	do	do	1.00	29,620	do			
302	22	19xx	do	do	do	1.00	31,170	do			

303	22	13	Muzzle	Inside	do	1.00	27,680	do	7.3154	14.90	Second casting.
318	22	13x	do	do	do	1.00	28,320	do	7.3109	15.06	
304	22	14	do	Outside	do	1.00	32,920	Fine granular	7.3404	17.08	
305	22	15	do	do	do	1.00	31,100	Granular	7.3285	16.73	
4693	23	1	Breech	Inside	23	1.00	25,010	do	....	....	
4694	23	1	Muzzle	do	23	1.00	28,020	do	....	....	
207	23	3	Breech	do	Grooved	1.00	28,790	do	7.3381	13.72	
208	23	4	do	Outside	do	1.00	28,350	do	7.3358	13.72	
·209	23	5	do	do	do	1.00	31,700	do	7.3411	13.92	
210	23	6	do	Inside	do	1.00	30,040	do	....	....	
211	23	7	do	do	do	1.00	30,100	do	....	....	
212	23	8	do	Outside	do	1.00	28,430	do	....	....	
213	23	9	do	do	do	1.00	28,310	do	....	....	
214	23	9x	do	do	do	1.00	30,020	do	....	....	
215	23	9xx	do	do	do	1.00	29,400	do	....	....	
216	23	3	Muzzle	Inside	do	1.00	29,810	do	7.3224	13.40	
217	23	4	do	Outside	do	1.00	31,730	do	7.3440	14.19	
218	23	5	do	do	do	1.00	29,800	do	7.3238	13.46	
4755	23	11	Breech	Inside	23	1.00	28,420	do	....	....	Second casting.
4756	23	11	Muzzle	do	23	1.00	28,890	do	....	....	
306	23	13	Breech	do	Grooved	1.00	29,220	do	7.3389	15.67	
307	23	14	do	Outside	do	1.00	29,070	do	7.3417	15.51	
308	23	15	do	do	do	1.00	33,100	do	7.3454	15.99	
309	23	16	do	Inside	do	1.00	32,580	do	....	....	
310	23	17	do	do	do	1.00	29,150	do	....	....	
311	23	18	do	Outside	do	1.00	29,320	do	....	....	
312	23	19	do	do	do	1.00	30,610	do	....	....	
313	23	19x	do	do	do	1.00	28,650	do	....	....	
314	23	19xx	do	do	do	1.00	28,980	do	....	....	
315	23	13	Muzzle	Inside	do	1.00	31,440	do	7.3177	17.08	
316	23	14	do	Outside	do	1.00	34,100	do	7.3498	16.47	
317	23	15	do	do	do	1.90	29,610	do	7.3118	15.75	
4697	24	1	Breech	Inside	23	1.00	27,160	do	....	....	
4698	24	1	Muzzle	do	23	1.00	28,560	do	....	....	
219	24	3	Breech	do	Grooved	1.00	28,030	do	7.3358	13.99	
220	24	4	do	Outside	do	1.00	27,990	do	7.3392	13.46	
221	24	5	do	do	do	1.00	29,250	do	7.3447	14.26	
222	24	6	do	Inside	do	1.00	28,920	do	....	....	
223	24	7	do	do	do	1.00	27,210	do	....	....	
224	24	8	do	Outside	do	1.00	28,180	do	....	....	
225	24	9	do	do	do	1.00	29,970	do	....	....	
226	24	9x	do	do	do	1.00	28,390	do	....	....	
227	24	9xx	do	do	do	1.00	29,130	do	....	....	
228	24	3	Muzzle	Inside	do	1.00	30,850	do	7.3324	14.26	
229	24	4	do	Outside	do	1.00	30,820	do	7.3471	14.12	
230	24	5	do	do	do	1.00	27,020	do	7.3355	14.12	
4709	25	1	Breech	Inside	23	1.00	27,130	do	....	....	
4710	25	1	Muzzle	do	23	1.00	24,720	Granular, coarse spangles	....	....	

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No of test.	Number of—		Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
	Mortar.	Specimen.			*Inches.*	*Sq. inch.*	*Pounds.*				
234	25	3	Breech	Inside	Grooved	1.00	29,030	Granular	7.3348	14.33	
235	25	4	...do	Outside	...do	1.00	30,300	......do	7.3404	13.53	
236	25	5	...do	...do	...do	1.00	30,500	......do	7.3466	14.40	
237	25	6	...do	Inside	...do	1.00	31,610	......do			
238	25	7	...do	...do	...do	1.00	30,320	......do			
239	25	8	...do	Outside	...do	1.00	29,700	......do			
240	25	9	...do	...do	...do	1.00	29,890	......do			
241	25	9x	...do	...do	...do	1.00	30,050	......do			
242	25	9xx	...do	...do	...do	1.00	30,380	......do			
243	25	3	Muzzle	Inside	...do	1.00	29,520	......do	7.3248	14.47	
244	25	4	...do	Outside	...do	1.00	39,960	Very fine granular	7.3783	15.91	
245	25	5	...do	...do	...do	1.00	33,100	Granular	7.3348	14.69	
4719	26	1	Breech	Inside	23	1.00	28,870	......do			
4720	26	1	Muzzle	...do	23	1.00	26,310	......do			
258	26	3	Breech	...do	Grooved	1.00	28,240	......do	7.3546	16.07	
259	26	4	...do	Outside	...do	1.00	29,150	......do	7.3586	16.07	
260	26	5	...do	...do	...do	1.00	32,410	......do	7.3600	15.99	
261	26	6	...do	Inside	...do	1.00	29,990	......do			
262	26	7	...do	...do	...do	1.00	28,320	......do			
263	26	8	...do	Outside	...do	1.00	30,500	......do			
264	26	9	...do	...do	...do	1.00	29,010	......do			
265	26	9x	...do	...do	...do	1.00	29,630	......do			
266	26	9xx	...do	...do	...do	1.00	29,910	......do			
267	26	3	Muzzle	Inside	...do	1.00	28,580	......do	7.3409	17.35	
268	26	4	...do	Outside	...do	1.00	29,530	......do	7.3325	16.81	
269	26	5	...do	...do	...do	1.00	29,820	......do	7.3348	17.08	
4739	27	1	Breech	Inside	23	1.00	25,940	......do			
4740	27	1	Muzzle	...do	23	1.00	26,580	......do			
270	27	3	Breech	...do	Grooved	1.00	28,610	......do	7.3424	16.73	
271	27	4	...do	Outside	...do	1.00	29,770	......do	7.3387	16.47	
272	27	5	...do	...do	...do	1.00	29,690	......do	7.3442	16.56	
273	27	6	...do	Inside	...do	1.00	27,390	......do			
274	27	7	...do	...do	...do	1.00	28,130	......do			
275	27	8	...do	Outside	...do	1.00	29,110	......do			
276	27	9	...do	...do	...do	1.00	29,130	......do			
277	27	9x	...do	...do	...do	1.00	28,580	......do			
278	27	9xx	...do	...do	...do	1.00	30,010	......do			
279	27	3	Muzzle	Inside	...do	1.00	32,310	......do	7.3447	17.35	
280	27	4	...do	Outside	...do	1.00	33,370	......do	7.3593	17.99	
281	27	5	...do	...do	...do	1.00	30,420	......do	7.3187	15.75	

12-INCH B. L. RIFLED MORTARS.

TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. inch.*	*Pounds.*				
964	2	12	Breech....	Inside	10.5	1.00	59,280	Triple flexure	....	....	
965	2	20	...do	Radial....	10.5	1.00	58,470	......do	....	....	
966	2	12	Muzzle ...	Inside	10.5	1.00	60,870	......do	....	....	
967	4	2	Breech....	Inside	10.5	1.00	63,100	......do	....	....	
968	4	10	...do	Radial....	10.5	1.00	60,100	......do	....	....	
969	4	2	Muzzle ...	Inside	10.5	1.00	60,480	......do	....	....	
970	5	2	Breech....	Inside	10.5	1.00	63,200	......do	....	....	
971	5	10	...do	Radial....	10	1.00	62,800	......do	....	....	
972	5	2	Muzzle ...	Inside	10.5	1.00	65,900	......do	....	....	
977	6	2	Breech....	Inside	10.5	1.00	61,200	......do	....	....	
978	6	10	...do	Radial....	10.5	1.00	60,200	......do	....	....	
979	6	2	Muzzle ...	Inside	10.5	1.00	59,300	......do	....	....	
980	7	2	Breech....	Inside	10.5	1.00	61,800	......do	....	....	
981	7	10	...do	Radial....	10.5	1.00	60,580	......do	....	....	
982	7	2	Muzzle ...	Inside	10.5	1.00	55,910	......do	....	....	
983	8	2	Breech ...	Inside	10.5	1.00	58,680	......do	....	....	
984	8	10	...do	Radial....	10.5	1.00	58,750	......do	....	....	
985	8	2	Muzzle ...	Inside	10.5	1.00	58,020	......do	....	....	
986	9	2	Breech....	Inside	10.5	1.00	59,500	......do	....	....	
987	9	10	...do	Radial....	10.5	1.00	59,650	......do	....	....	
988	9	2	Muzzle ...	Inside	10.5	1.00	57,200	......do	....	....	
992	10	2	Breech....	Inside	10.5	1.00	57,200	......do	....	....	
993	10	10	...do.	Radial	10.5	1.00	58,980	......do	....	....	
994	10	2	Muzzle ...	Inside	10.5	1.00	56,380	......do	....	....	
1001	10	12	Breech....	Inside	10.5	1.00	59,200	......do	....	....	Second casting.
1002	10	20	...do	Radial....	10.5	1.00	58,980	......do	....	....	
1003	10	12	Muzzle ...	Inside	10.5	1.00	57,970	......do	....	....	
1025	10	32	Breech....	Inside	10.5	1.00	60,380	......do	....	....	Fourth casting.
1026	10	40	...do	Radial....	10.5	1.00	60,650	......do	....	....	
1027	10	32	Muzzle ...	Inside	10.5	1.00	58,620	......do	....	....	

TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES—Continued.

No. of test.	Number of—		Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Specific gravity.	Hardness	Remarks.
	Mortar.	Specimen.									
					Inches.	*Sq. inch.*	*Pounds.*				
995	11	2	Breech	Inside	10.5	1.00	60,020	Triple flexure			
996	11	10	...do	Radial	10.5	1.00	61,660	......do			
997	11	2	Muzzle	Inside	10.5	1.00	58,500	......do			
1010	12	22	Breech	Inside	10.5	1.00	59,060	......do			Third casting.
1011	12	30	...do	Radial	10.5	1.00	58,200	......do			
1012	12	22	Muzzle	Inside	10.5	1.00	58,500	......do			
1028	12	32	Breech	Inside	10.5	1.00	64,460	......do			Fourth casting.
1029	12	40	...do	Radial	10.5	1.00	64,170	......do			
1030	12	32	Muzzle	Inside	10.5	1.00	64,220	......do			
1004	13	2	Breech	Inside	10.5	1.00	59,780	......do			
1005	13	10	...do	Radial	10.5	1.00	59,580	......do			
1006	13	2	Muzzle	Inside	10.5	1.00	55,060	......do			
1031	13	12	Breech	Inside	10.5	1.00	61,500	......do			Second casting.
1032	13	20	...do	Radial	10.5	1.00	62,800	......do			
1033	13	12	Muzzle	Inside	10.5	1.00	62,580	......do			
1040	13	12	Breech	Inside	10.5	1.00	65,480	......do			Extra disk from second casting.
1041	13	20	...do	Radial	10.5	1.00	64,460	......do			
1007	14	2	Breech	Inside	10.5	1.00	60,300	......do			
1008	14	10	...do	Radial	10.5	1.00	59,100	......do			
1009	14	2	Muzzle	Inside	10.5	1.00	57,500	......do			
1034	14	12	Breech	Inside	10.5	1.00	60,900	......do			Second casting.
1035	14	20	...do	Radial	10.5	1.00	61,780	......do			
1036	14	12	Muzzle	Inside	10.5	1.00	59,600	......do			
1013	15	2	Breech	Inside	10.5	1.00	56,500	......do			
1014	15	10	...do	Radial	10.5	1.00	57,580	......do			
1015	15	2	Muzzle	Inside	10.5	1.00	55,080	......do			
1037	15	12	Breech	Inside	10.5	1.00	61,650	......do			Second casting.
1038	15	20	...do	Radial	10.5	1.00	61,560	......do			
1039	15	12	Muzzle	Inside	10.5	1.00	59,800	......do			
1016	16	2	Breech	Inside	10.5	1.00	57,700	......do			
1017	16	10	...do	Radial	10.5	1.00	59,380	......do			
1018	16	2	Muzzle	Inside	10.5	1.00	58,440	......do			

1042	16	12	Breech....	Inside	10.5	1.00	63,400	......do	....	....	Second casting.
1043	16	20	...do	Radial	10.5	1.00	63,500	......do	....	....	
1044	16	12	Muzzle ...	Inside	10.5	1.00	62,760	......do	....	....	
1019	17	2	Breech....	Inside	10.5	1.00	62,080	......do	....	....	
1020	17	10	...do	Radial	10.5	1.00	64,950	......do	....	....	
1021	17	2	Muzzle ...	Inside	10.5	1.00	58,000	......do	....	....	
1022	18	2	Breech....	Inside	10.5	1.00	61,100	......do	....	....	
1023	18	10	...do	Radial	10.5	1.00	61,280	......do	....	....	
1024	18	2	Muzzle ...	Inside	10.5	1.00	60,930	......do	....	....	
1045	19	2	Breech....	Inside	10.5	1.00	59,720	......do	....	....	
1046	19	10	...do	Radial	10.5	1.00	58,040	......do	....	....	
1047	19	2	Muzzle ...	Inside	10.5	1.00	57,980	......do	....	....	
1048	20	2	Breech....	Inside	10.5	1.00	62,350	......do	....	....	
1049	20	10	...do	Radial	10.5	1.00	61,980	......do	....	....	
1050	29	2	Muzzle ...	Inside	10.5	1.00	59,700	......do	....	....	
1073	20	12	Breech....	Inside	10.5	1.00	60,670	......do	....	....	Second casting.
1074	20	20	...do	Radial	10.5	1.00	60,200	......do	....	....	
1075	20	12	Muzzle ...	Inside	10.5	1.00	60,050	......do	....	....	
1051	21	2	Breech....	Inside	10.5	1.00	60,200	......do	....	....	
1052	21	10	...do	Radial	10.5	1.00	59,580	......do	....	....	
1053	21	2	Muzzle ...	Inside	10.5	1.00	57,490	......do	....	....	
1069	21	2	Muzzle ...	Inside	10.5	1.00	57,590	......do	....	....	Extra disk.
1082	21	12	Breech....	Inside	10.5	1.00	61,700	......do	....	....	Second casting.
1083	21	20	...do	Radial	10.5	1.00	60,880	......do	....	....	
1084	21	12	Muzzle ...	Inside	10.5	1.00	59,440	......do	....	....	
1054	22	2	Breech....	Inside	10.5	1.00	58,100	......do	....	....	
1055	22	10	...do	Radial	10.5	1.00	57,980	......do	....	....	
1056	22	2	Muzzle ...	Inside	10.5	1.00	54,910	......do	....	....	
1085	22	12	Breech....	Inside	10.5	1.00	60,280	......do	....	....	Second casting.
1086	22	20	...do	Radial	10.5	1.00	60,040	......do	....	....	
1087	22	12	Muzzle ...	Inside	10.5	1.00	60,880	......do	....	....	
1063	23	2	Breech....	Inside	10.5	1.00	59,570	......do	....	....	
1064	23	10	...do	Radial	10.5	1.00	60,560	......do	....	....	
1065	23	2	Muzzle ...	Inside	10.5	1.00	58,400	......do	....	....	
1088	23	12	Breech....	Inside	10.5	1.00	59,720	......do	....	....	Second casting.
1089	23	20	...do ......,	Radial	10.5	1.00	60,320	......do	....	....	
1090	23	13	Muzzle ...	Inside	10.5	1.00	60,820	......do	....	....	
1066	24	2	Breech....	Inside	10.5	1.00	60,040	......do	....	....	
1067	24	10	...do	Radial	10.5	1.00	59,200	......do	....	....	

TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES—Continued.

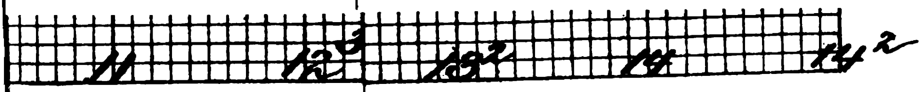
No. of test.	Number of—		Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Specific gravity.	Hardness.	Remarks.
	Mortar.	Specimen.									
					Inches.	*Sq. inch.*	*Pounds.*				
1068	24	2	Muzzle ...	Inside	10.5	1.00	59,900	Triple flexure..........	....	....	
1070	25	2	Breech....	Inside	10.5	1.00	58,040	......do..........	....	....	
1071	25	10	...do	Radial	10.5	1.00	59,309	......do..........	....	....	
1072	25	2	Muzzle ...	Inside	10.5	1.00	59,700	......do..........	....	....	
1076	26	2	Breech....	Inside	10.5	1.00	62,520	......do..........	....	....	
1077	26	10	...do	Radial	10.5	1.00	62,580	......do..........	....	....	
1078	26	2	Muzzle ...	Inside	10.5	1.00	62,750	......do..........	....	....	
1079	27	2	Breech....	Inside	10.5	1.00	59,100	......do..........	....	....	
1080	27	10	...do	Radial	10.5	1.00	58,980	......do..........	....	....	
1081	27	2	Muzzle ...	Inside	10.5	1.00	59,460	......do..........	....	....	

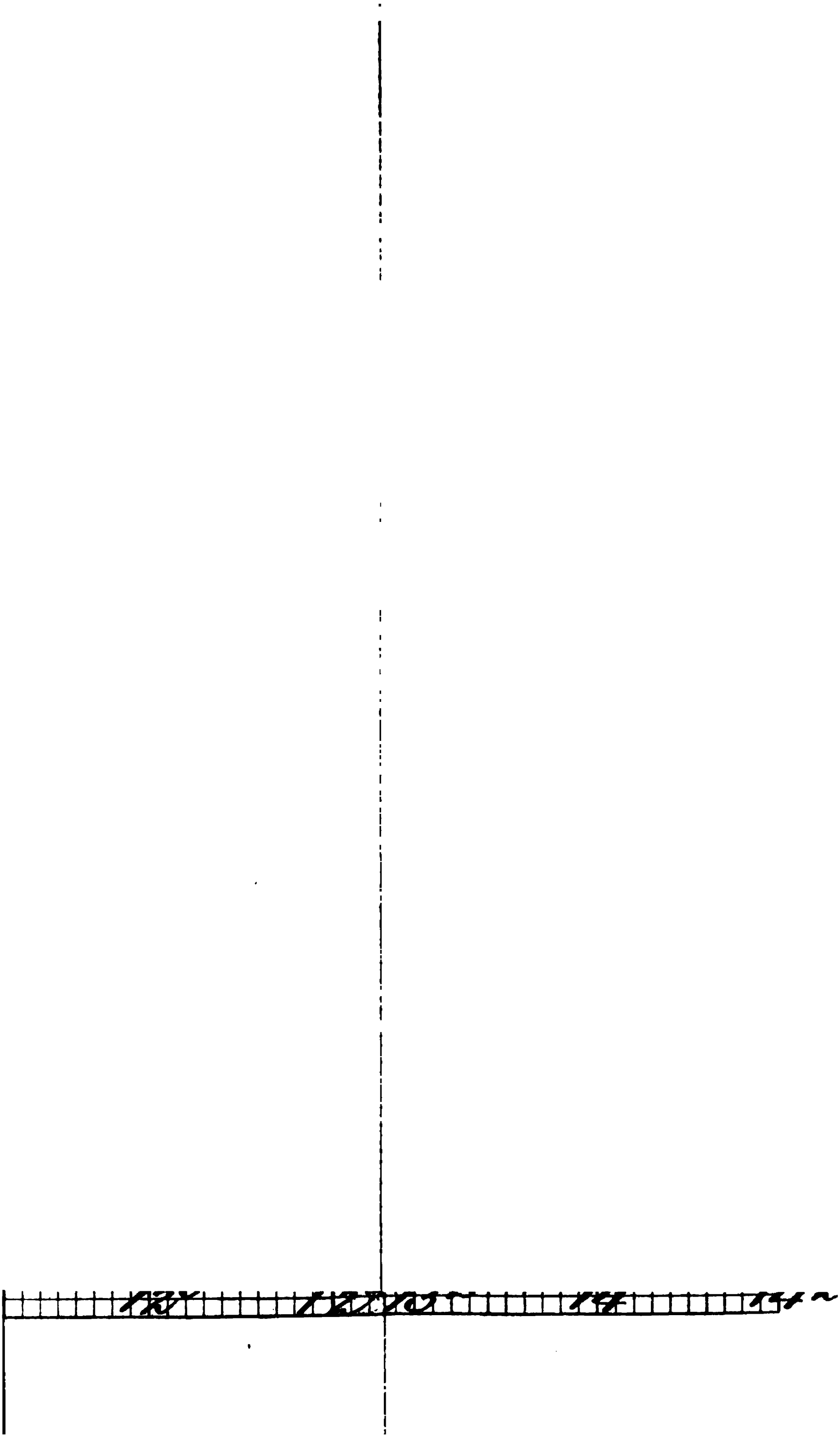
12-INCH B. L. RIFLED MORTARS.

Diagrams showing chemical composition, tensile strength, specific gravity, and hardness of cast-iron bodies.

The full lines in the diagrams represent results obtained with the long tension specimens.

The mean results of the grooved tenacity specimens are plotted in dotted lines, rejecting from the averages and indicating on the diagrams by dotted circles specimens which gave exceptionally high tensile strength.





12-INCH B. L. RIFLED MORTARS.

SPECIFIC GRAVITY AND HARDNESS OF STEEL HOOPS.

No tension tests of these specimens.

No. of mortar.	Mark on specimen.	Specific gravity.	Hardness.	Remarks.
46	12 M R_{46} A_3—R_1 M	7.8261	22.90	
47	12 M R_{47} A_3—R_1 M	7.8422	22.64	
61	12 M R_{61} A_3—R_1 M	7.8408	22.52	
64	12 M R_{64} A_3—R_1 M	7.8468	21.89	
48	12 M R_{48} A_4—R_1 M	7.8444	27.49	
49	12 M R_{49} A_4—R_1 M	7.8402	21.40	
50	12 M R_{50} A_4—R_1 M	7.8442	21.89	
56	12 M R_{56} A_4—R_1 M	7.8394	22.90	
57	12 M R_{57} A_4—R_1 M	7.8397	17.90	
58	12 M R_{58} A_4—R_1 M	7.8485	22.64	
59	12 M R_{59} A_4—R_1 M	7.8430	20.82	
72	12 M R_{72} A_4—R_1 M	7.8421	23.84	
73	12 M R_{73} A_4—R_1 M	7.8433	21.52	
32	12 M R_{32} A_5—R_1 M	7.8382	24.40	
33	12 M R_{33} A_5—R_1 M	7.8388	22.26	
34	12 M R_{34} A_5—R_1 M	7.8497	19.81	
35	12 M R_{35} A_5—R_1 M	7.8396	21.05	
36	12 M R_{36} A_5—R_1 M	7.8452	19.06	
37	12 M R_{37} A_5—R_1 M	7.8433	21.52	
38	12 M R_{38} A_5—R_1 M	7.8503	21.17	
39	12 M R_{39} A_5—R_1 M	7.8525	19.50	
40	12 M R_{40} A_5—R_1 M	7.8455	20.03	
69	12 M R_{69} A_5—R_1 M	7.8481	20.70	
43	12 M R_{43} B_1—R_1 M	7.8435	24.54	
51	12 M R_{51} B_1—R_1 M	7.8498	21.64	
54	12 M R_{54} B_1—R_1 M	7.8391	21.89	
55	12 M R_{55} B_1—R_1 M	7.8473	23.43	
60	12 M R_{60} B_1—R_1 M	7.8462	19.92	
62	12 M R_{62} B_1—R_1 M	7.8412	18.58	
63	12 M R_{63} B_1—R_1 M	7.8430	21.40	
65	12 M R_{65} B_1—R_1 M	7.8466	20.93	
68	12 M R_{68} B_1—R_1 M	7.8449	22.02	
71	12 M R_{72} B_3—R_1 M	7.8479	22.77	
52	12 M R_{52} B_4—R_1 M	7.8449	19.60	
53	12 M R_{53} B_4—R_1 M	7.8426	20.70	
66	12 M R_{66} B_5—R_1 M	7.8435	20.25	
67	12 M R_{67} B_5—R_1 M	7.8395	20.36	
70	12 M R_{70} B_5—R_1 M	7.8469	23.70	

SQUARE STEEL WIRE.

″.15 SQUARE TINNED STEEL WIRE.

WIRE FROM COILS FOR USE ON 10-INCH WOODBRIDGE W. W. GUN.

WIRE MANUFACTURED BY THE TRENTON IRON COMPANY.

REJECTED COIL.

Mean sectional area, ″.1503 × ″.1498 = .0225 square inch.
Specimen 21½ feet long between jaws of the testing machine.

No. 5489.

FIRST FRACTURE.

Tensile strength, 3,273 pounds = 145,470 pounds per square inch.
Area at fracture, ″.1495 × ″.1493 = .0223 square inch.
Contraction of area, 00.9 per cent.
Fractured about 12″ from middle of length. Appearance silky, oblique.

No. 5490.

SECOND FRACTURE.

Specimen 9 feet long.
Tensile strength, 3,365 pounds = 149,560 pounds per square inch.
Area at fracture, ″.1492 × ″.1488 = .0222 square inch.
Contraction of area, 1.3 per cent.
Fractured 39″ from face of jaws. Appearance silky, oblique.

No. 5491.

THIRD FRACTURE.

Specimen 3 feet 9 inches long.
Tensile strength, 3,280 pounds =145,780 pounds per square inch.
Area at fracture, ″.1494 × ″.1493 = .0223 square inch.
Contraction of area, 00.9 per cent.
Fractured at middle of the length. Appearance silky, conoidal.

No. 5492.

FOURTH FRACTURE.

Specimen 3 feet 10 inches long.
Tensile strength, 3370 pounds = 149,780 pounds per square inch.
Area at fracture, ″.1490 × ″.1492 = .0222 square inch.
Contraction of area, 1.3 per cent.
Fractured at face of jaws. Appearance silky, conoidal.

Lot of five samples from same coil of wire.

No. of test.	Dimensions.		Sectional area.	Tensile strength.		Area at fracture.	Contraction of area.
	Width.	Thickness.		Total.	Per square inch.		
	Inch.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Inch. Inch. Sq. in.*	*Per ct.*
5493	.1497	.1496	.0224	3,548	158,390	.1486 × .1486 = .0221	1.3
5494	.1497	.1493	.0224	3,572	159,460	.1486 × .1485 = .0221	1.3
5495	.1498	.1492	.0224	2,980	133,040	.1492 × .1491 = .0222	0.9
5496	.1500	.1494	.0224	2,855	127,400	.1492 × .1489 = .0222	0.9
5497	.1497	.1493	.0224	3,585	160,040	.1486 × .1486 = .0221	1.3

Fractures silky, conoidal.
Nos. 5494–5497 were taken from one end of coil.

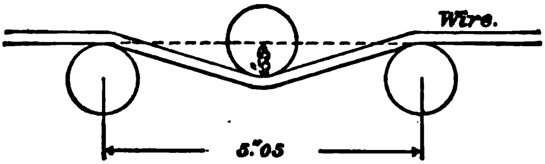
Lot of five samples from same coil of wire.

No. of test.	Dimensions.		Sectional area.	Tensile strength.		Area at fracture.	Contraction of area.
	Width.	Thickness.		Total.	Per square inch.		
	Inch.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Inch. Inch. Sq. in.*	*Per ct.*
5498	.1496	.1497	.0224	3,548	158,390	.1486 × .1486 = .0221	1.3
5499	.1494	.1497	.0224	1,460	65,180	....	....
5500	.1492	.1497	.0223	2,689	120,580	....	....
5501	.1496	.1494	.0223	1,960	87,890	....	....
5502	.1497	.1493	.0224	1,345	60,040	....	....

No. of test.	Fractures.	Remarks.
5498	Silky	Middle bend took natural curve of coil. Tested on 3-pin fixture.
5499	....do	
5500	....do	
5501	....do	
5502	....do	

Nos. 5499–5502 were taken from one end of coil.

Arrangement of pins in 3-pin fixture.



FOUR SAMPLES OF ".15 SQUARE TINNED STEEL WIRE FROM SAME COIL.

No. 5503.

Sectional area, ".1493×1495=.022 square inch.
Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
110	5, 000	0.	0.	Initial load.
220	10, 000	.0025	....	
440	20, 000	.0061	....	
660	30, 000	.0099	....	
880	40, 000	.0136	....	
1, 100	50, 000	.0178	....	
1, 320	60. 000	.0219	....	
1, 540	70, 000	.0262	....	
1, 760	80, 000	.0310	....	
1, 980	90, 000	.0363	....	
2, 200	100, 000	.0420	.0040	
2, 420	110, 000	.0485	....	
2, 640	120, 000	.0558	....	Elastic limit.
2, 860	130, 000	.0649	.0144	
3, 080	140, 000	.0735	.0199	
3, 682	167, 360	....	....	Tensile strength.
0	0	.10	....	= 1.0 per cent.

Area at fracture, ".130×".130=.017 square inch.
Contraction of area, 22.7 per cent.
Fractured outside the gauged length. Appearance, silky.

No. 5504.

Sectional area, ".1500×".1500=.0225 square inch.
Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5, 000	0.	0.	Initial load.
225	10, 000	.0019	....	
450	20, 000	.0052	....	
675	30, 000	.0087	....	
900	40, 000	.0119	....	
1, 125	50, 000	.0154	....	
1, 350	60, 000	.0187	....	
1, 575	70, 000	.0229	....	
1, 800	80, 000	.0262	....	
2, 025	90, 000	.0300	....	
2, 250	100, 000	.0340	.0012	
2, 475	110, 000	.0380	....	
2, 700	120, 000	.0420	....	
2, 925	130, 000	.0466	.0030	
3, 150	140, 000	.0512	....	
3, 375	150, 000	.0575	....	Elastic limit.
3, 600	160, 000	.0650	.0098	
3, 746	166, 490	....	....	Tensile strength.
0	0	.01	....	=0.1 per cent.

Area at fracture, ".131×".131=.0172 square inch.
Contraction of area, 23.5 per cent.
Fractured outside the gauged length at the grips. Appearance, silky.

No. 5505.

Sectional area, .″1498×.″1496=.0224 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	Initial load.
224	10,000	.0028	....	
448	20,000	.0069	....	
672	30,000	.0103	....	
896	40,000	.0143	....	
1,120	50,000	.0182	....	
1,344	60,000	.0226	....	
1,568	70,000	.0270	....	
1,792	80.000	.0318	....	
2.016	90,000	.0364	....	
2,240	100,000	.0417	.0040	
2,464	110,000	.0471	....	
2,688	120,000	.0543	....	Elastic limit.
2,912	130,000	.0620	.0109	
3,136	140,000	.0727	.0169	
3,738	166,875	....	....	Tensile strength.
0	0	.12	....	=1.2 per cent.

Area at fracture ″.145×.″145=.0210 square inch.
Contraction of area, 6.3 per cent.
Fractured at jaws of machine. Appearance silky, oblique.

No. 5506.

Sectional area, ″.1494×″.1494=″.0223 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	Initial load.
112	5,000	0.	0.	
223	10,000	.0027	....	
446	20,000	.0063	....	
669	30,000	.0101	....	
892	40,000	.0141	....	
1,115	50,000	.0179	....	
1,338	60,000	.0213	....	
1,561	70,000	.0259	....	
1,784	80,000	.0300	....	
2,007	90,000	.0343	....	
2,230	100,000	.0389	.0033	
2,453	110,000	.0434	....	
2,676	120,000	.0499	....	
2,899	130,000	.0564	.0082	
3,122	140,000	.0649	....	Elastic limit.
3,345	150,000	.0771	....	
3,656	163,950	....	....	Tensile strength.
0	0	.02	....	=0.2 per cent.

Area at fracture, ″.131×″.130=.0170 square inch.
Contraction of area, 23.8 per cent.
Fractured at jaws of machine. Appearance, silky.

FOUR SPECIMENS FROM ADJOINING PARTS OF SAME WIRE.

Specimens marked — tested as cut from coil, except slight straightening in rolls.

Specimens marked × curvature of coil reversed to radius of 18″, then nearly straightened in rolls.

No. of test.	Marks.	Dimensions.		Sectional area.	Tensile strength.		Area at fracture.	Contraction of area.
		Width.	Thickness.		Total.	Per square inch.		
		Inch.	*Inch.*	*Sq. In.*	*Pounds.*	*Pounds.*	*In. In. Sq. In.*	*Per cent.*
5511	×	.1495	.1490	.0223	3,148	141,170	.145×.145=.0210	5.8
5512	—	.1492	.1493	.0223	3,552	159,280	.146×.146=.0213	4.5
5513	×	.1495	.1491	.0223	3,398	152,380	.148×.148=.0219	1.8
5514	—	.1492	.1494	.0223	3,664	164,300	.148×.148=.0219	1.8

Fractures, silky, conoidal ends.

SIX SPECIMENS, ″.15 SQUARE, TINNED STEEL WIRE FROM SAME COIL.

Rejected after three breaks in the winding machine used on the construction of 10-inch W. W. gun.

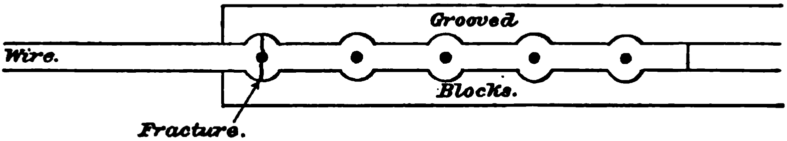
No. of test.	Marks.	Treatment.	Dimensions.		Sectional area.	Tensile strength.	
			Width.	Thickness.		Total.	Per square inch.
			Inch.	*Inch.*	*Sq. In.*	*Pounds.*	*Pounds.*
5524	I	Taken from winding reel. Curve of coil reversed.	.1496	.1497	.0224	3,704	165,360
5525	I		.1496	.1497	.0224	3,734	166,700
5526	II	Curve of coil reversed to curvature of reel twice.	.1496	.1496	.0224	3,498	156,160
5527	II		.1496	.1495	.0224	3,285	146,650
5528	III	Curve of coil reversed to curvature of reel three times.	.1495	.1495	.0224	3,756	167,680
5529	III		.1496	.1495	.0224	3,622	161,700

Contraction of area inappreciable.
Fractures silky.
Diameter of reel of winding machine 42½″.

Tensile test of wire fastening used on Woodbridge 10″ wire-wrapped gun.

″.15 square tinned steel wire.

Ends secured in grooved blocks by expansion of metal by means of center punch into drilled pockets.



Five pockets for each wire end.
Tensile strength, 2,948 pounds.
Fractured wire at first pocket.

THREE SAMPLES ″.15 SQUARE TINNED STEEL WIRE, MANUFACTURED BY R. H. WOLFF & CO.

Straightened in rolls before testing; from coil of 20″ radius.

No. 5507.

Sectional area, ″.1495×″.1500=.0224 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	Initial load.
224	10,000	.0024	....	
448	20,000	.0060	....	
672	30,000	.0092	....	
896	40,000	.0125	....	
1,120	50,000	.0159	....	
1,344	60,000	.0192	....	
1,568	70,000	.0234	....	
1,792	80,000	.0275	....	
2,016	90,000	.0314	....	
2,240	100,000	.0359	.0023	
2,464	110,000	.0398	....	
2,688	120,000	.0444	....	
2,912	130,000	.0485	....	
3,136	140,000	.0535	.0053	
3,360	150,000	.0592	....	
3,584	160,000	.0642	....	
3,808	170,000	.0620	....	Micrometer disturbed.
4,032	180,000	.0684	....	
4,256	190,000	.0772	....	Elastic limit.
4,480	200,000	.0894	.0150	
5,112	228,210	....	....	Tensile strength.
0	0	.05	....	=0.5 per cent.

Area at fracture, ″.126×″.126=.0159 square inch.
Contraction of area, 29.0 per cent.
Fractured outside the gauged length. Appearance, silky.

No. 5508.

Tested on 3-pin fixture.
Sectional area, ″.1495×″.1495=.0224 square inch.
Tensile strength, 4,610 pounds=205,800 pounds per square inch.
Area at fracture, ″.123×″.123=.0151 square inch.
Contraction of area, 32.6 per cent.
Appearance of fracture, silky.

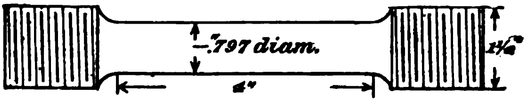
No. 5509.

Tested on 3-pin fixture.
Sectional area, ″.1508×″.1492=.0225 square inch.
Tensile strength, 4,687 pounds=208,310 pounds per square inch.
Area at fracture, ″.120×″.120=.0144 square inch.
Contraction of area, 36.0 per cent.
Appearance of fracture, silky.

BRONZE FROM WATERTOWN ARSENAL FOUNDRY.

No. 5735.

Specimen from a sample cast of bronze mixture to be used for 8-inch B. L. rifle carriage casting.

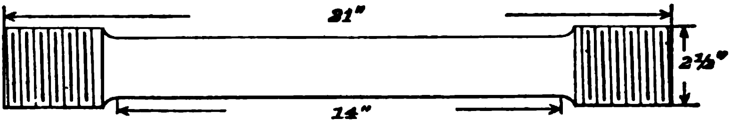


Sectional area, .50 square inch.
Elastic limit, 6,800 pounds = 13,600 pounds per square inch.
Tensile strength, 16,640 pounds = 33,280 pounds per square inch.
Elongation in 4 inches, ″.72 = 18.0 per cent.
Elongation of inch sections, ″.16, ″.17, ″.21*, ″.18.
Diameter at fracture, ″.72; area, .407 square inch.
Contraction of area, 18.6 per cent.
Appearance of fracture, uniform light yellow color.

Composition	Copper	87.00
	Tin	7.78
	Zinc	4.85

BRONZE FROM NEW YORK NAVY-YARD.

Form of specimens.



No. 5765.

Marks, A_1.
Diameter, 1''.875.
Sectional area, 2''.76 square inches.
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
2,760	1,000	0.	0.	0.	0.	Initial load.
5,520	2,000	.00010	.00010	....	....	
8,280	3,000	.00019	.00009	....	....	
11,040	4,000	.00029	.00010	....	....	
13,800	5,000	.00039	.00010	.00003	.00003	
16,560	6,000	.00050	.00011	....	....	
19,320	7.000	.00060	.00010	....	....	Elastic limit.
22,080	8,000	.00078	.00013	....	....	
24,840	9,000	.00089	.00016	....	....	
27,600	10,000	.00111	.00022	.00027	.00024	
30,360	11,000	.00151	.00040	....	....	
33,120	12,000	.00210	.00059	....	....	
35,880	13,000	.00367	.00157	....	....	
38,640	14,000	.00660	.00293	....	....	
41,400	15,000	.01436	.00776	....	....	
44,160	16,000	.021	.00664	....	....	Cracks open in surface of stem.
46,920	17,000	.030	.009	....	....	
49,680	18,000	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section.................pounds..	18,000
Elastic limit per square inch of original section ....do...	7,000
Elongation per inch after rupture.................inch..	.043
Elongation per inch under strain at elastic limit.................do...	.00060
Reduction in diameter at point of rupture.................do...	.065
Reduction in area after rupture, per cent of original section	6.9
Character of broken surface.....................vesicular, the color varying from light to dark yellow	
Elongation of inch sections..''.06, ''.04, ''.05, ''.05, ''.12*, ''.05, ''.04, ''.03, ''.03, ''.03, ''.04, ''.03, ''.02, ''.01	
Composition .... Copper	87.00
Tin.................	10.24
Zinc.................	2.02

No. 5766.

Marks, A_2.
Diameter, 1''.875.
Sectional area, 2.76 square inches.
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
2,760	1,000	0.	0.	0.	0.	Initial load.
5,520	2,000	.00011	.00011	....	....	
8,280	3,000	.00022	.00011	....	....	
11,040	4,000	.00032	.00010	....	....	
13,800	5,000	.00043	.00011	.00003	.00003	
16,560	6,000	.00054	.00011	....	....	
19,320	7,000	.00066	.00012	....	....	Elastic limit.
22,080	8,000	.00081	.00015	....	....	
24,840	9,000	.00103	.00022	....	....	
27,600	10,000	.00139	.00036	.00045	.00042	
30,360	11,000	.00204	.00065	....	....	
33,120	12,000	.00344	.00140	....	....	
35,880	13,000	.00642	.00298	....	....	
38,640	14,000	.01110	.00468	....	....	
41,400	15,000	.01910	.00800	.01745	.01700	
44,160	16,000	.029	....	....	....	
46,700	16,920	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds..	16,920
Elastic limit per square inch of original section ....do...	7,000
Elongation per inch after rupture, in 14 inches............inch..	.034
Elongation per inch under strain at elastic limit............do...	.00066
Reduction in diameter at point of rupture............do...	.035
Reduction in area after rupture, per cent of original section............	3.6
Position of rupture	at neck
Character of broken surface............	irregular, varying in color from light to dark yellow
Elongation of inch sections....	''.04, ''.01, ''.03, ''.03, ''.02, ''.05, ''.02, ''.04, ''.03, ''.04, ''.03, ''.03, ''.04, ''.05

No. 5767.

Marks, B.
Diameter, 1.″875.
Sectional area, 2.76 square inches.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
2,760	1,000	0.	0.	0.	0.	Initial load.
5,520	2,000	.00011	.00011			
8,280	3,000	.00021	.00010			
11,040	4,000	.00031	.00010			
13,800	5,000	.00041	.00010	.00002	.00002	
16,560	6,000	.00052	.00011			
19,320	7,000	.00062	.00010			
22,080	8,000	.00074	.00012			Elastic limit.
24,840	9,000	.00090	.00016			
27,600	10,000	.00110	.00020	.00022	.00020	
30,360	11,000	.00151	.00041			
33,120	12,000	.00253	.00102			
35,880	13,000	.00395	.00142			
38,640	14,000	.00710	.00315			
41,400	15,000	.01250	.00540	.01101	.01079	
43,800	15,870					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	15.870
Elastic limit per square inch of original section	do...	8,000
Elongation per inch after rupture, in 14 inches	inch..	.010
Elongation per inch under strain at elastic limit	do...	.00074
Reduction in diameter at point of rupture		inappreciable
Character of broken surface		irregular, color variable, light lavender to copper colored
Elongation of inch sections		″.03, ″.01, ″.01, ″.02, ″.00, ″.01, ″.01, ″.02, ″.01, ″.00, ″.01, ″.01, ″.01, ″.00
Composition	Copper	86.98
	Tin	9.00
	Zinc	4.00

No. 5768.

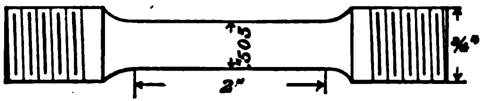
Marks, C.
Diameter, 1''.875.
Sectional area, 2.76 square inches.
Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
2,760	1,000	0.	0.	0.	.0	Initial load.
5,520	2,000	.00010	.00010			
8,280	3,000	.00020	.00010			
11,040	4,000	.00030	.00010			
13,800	5,000	.00040	.00010	.00003	.00003	
16,560	6,000	.00052	.00012			Elastic limit.
19,320	7,000	.00067	.00015			
22,080	8,000	.00090	.00023			
24,840	9,000	.00140	.00050			
27,600	10,000	.00294	.00154	.00213	.00210	
30,360	11,000	.00643	.00349			
33,120	12,000	.01535	.00892			
35,880	13,000	.025	.00965			
38,640	14,000	.034	.009			
41,400	15,000	.046	.012			
44,160	16,000	.058	.012			
46,920	17,000	.070	.012			
49,680	18,000	.084	.014			
52,440	19,000	.100	.016			
55,200	20,000	.116	.016			
57,700	20,900	.133	.017			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	20,900
Elastic limit per square inch of original section	do	6,000
Elongation per inch after rupture, in 14 inches	inch	.138
Elongation per inch under strain at elastic limit	do	.00052
Reduction in diameter at point of rupture	do	.195
Reduction in area after rupture, per cent of original section		19.6
Character of broken surface	irregular, copper-colored and brown. Numerous cracks developed in the surface of stem.	
Elongation of inch sections	''.14, ''.13, ''.12, ''.13, ''.14, ''.12, ''.14, ''.27*, ''.14, ''.14, ''.10, ''.11, ''.13	
Composition: Copper		94.46
Composition: Tin		4.91

Specimens from steel forgings for 8-inch B. L. rifle barbette carriage.

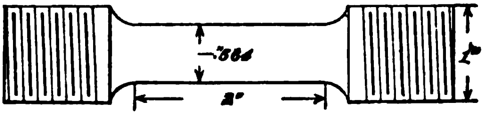


No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 2 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.
				Total.	Per square inch.	Total.	Per square inch.						
		Inch.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inch.*	*Pr. ct.*	"	*Sq. in.*	*Pr. ct.*	
5720	WA$_1$ In. T$_1$...	.505	.29	9,830	49,150	18,360	91,800	.44	22.0	Diam., .41=	.132	34.0	Silky, trace of granulation.
5721	WA$_2$ In. L$_1$...	.505	.20	9,790	48,950	14,210	71,050	.65	32.5	Diam., .33=	.085	57.2	Fine silky.
5722	WA$_2$ In. L$_2$...	.505	.20	10,870	54,350	15,990	74,950	.63	31.5	Diam., .35=	.096	51.9	Do.
5723	WA$_3$ In. L$_1$...	.505	.20	11,150	55,750	18,820	94,100	.47	23.5	Diam., .38=	.113	43.8	Do.
5724	WA$_4$ In. L$_1$...	.505	.20	8,400	42,000	13,410	67,050	.05	2.5	Diam., .505.........		(*)	Granular, flaky streak.
5724*a*	WA$_4$ In. L$_2$...	.505	.20	9,520	47,600	18,110	90,550	.34	17.0	Diam., .46=	.166	16.9	Granular, flaky spot at circumference. Opened minute cracks in vicinity of rupture.
5725	WA$_4$ In. T$_1$ M.	.505	.20	9,970	49,850	17,990	89,950	.32	16.0	Diam., .45=	.159	20.5	Granular, dull spot at circumference.
5726	WA$_5$ In. L$_1$...	.505	.20	8,780	43,900	16,770	83,850	.15	7.5	Diam., .48=	.181	9.5	Granular.
5727	WA$_6$ In. T$_1$ M.	.505	.20	9,510	47,550	18,150	90,750	.42	21.0	Diam., .42=	.138	30.7	Silky, granular at circumference.
5728	WA$_6$ SQ L$_1$...	.505	.20	11,750	58,750	18,220	91,100	.49	24.5	Diam., .37=	.107	46.2	Fine silky.
5729	WA$_1$ S H L$_1$ A	.505	.20	12,150	60,750	18,370	91,850	.53	26.5	Diam., .36=	.102	49.1	Do.
5730	WA$_1$ S H L$_1$ C	.505	.20	9,500	47,500	19,060	95,300	.46	23.0	Diam., .40=	.126	37.1	Silky.
5731	WA$_2$ S H L$_1$ A	.505	.20	11,020	55,100	17,840	89,200	.57	28.5	Diam., .34=	.091	54.6	Fine silky.
5732	WA$_2$ S H L$_1$ C	.505	.20	10,980	54,900	18,800	94,000	.48	24.0	Diam., .37=	.107	46.2	Do.

*Inappreciable.

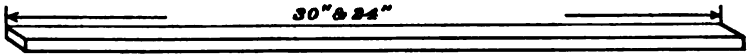
No. 5707.

Material for nuts for 8″ B. L. rifle barbette carriage.



Sectional area, .25 square inch.
Elastic limit, 10,980 pounds=43,920 pounds per square inch.
Tensile strength, 14,770 pounds=59,080 pounds per square inch.
Elongation in 2 inches, ″.76=38 per cent.
Elongation of inch sections, ″.48* ″.28.
Diameter at fracture, ″.35. Area, .0962 square inch.
Contraction of area, 61.5 per cent.
Appearance of fracture, fine silky.

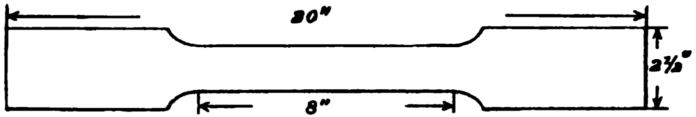
STEEL PLATE FOR 8" B. L. RIFLE BARBETTE CARRIAGE.



No. of test.	Mark on specimen.	Dimensions in inches.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.						
				Sq. in.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*Per ct.*	*In. In. Sq.in.*	*Pr. ct.*		"
5708	1	.998	.490	.489	17,700	36,190	26,970	55,150	2.54	25.4	.66×.25=.165	66.2	Silky	.15, .15, .18, .19, .19, .25, .21, .70* .28, .24
5709	2	.994	.487	.484	16,520	34,130	26,990	55,760	2.58	25.8	.65×.27=.175	63.8	...do........	.72,* .28, .22. .20, .21, .22, .21, .16, .18, .18
5710	3	.994	.496	.493	16,680	33,830	29,590	60,020	2.70	27.0	.68×.28=.190	61.5	...do........	.35, .59,* .25, .25, .24, .21, .17, .18, .24, .22
5711	4	.994	.499	.496	17,850	35,990	29,880	60,240	2.10	21.0	.69×.28=.193	61.1	...do........	.17, .15, .16, .15, .16, .15, .16, .15, .23, .62*
5712	5	.906	.412	.410	16,300	39,760	23,120	56,390	2.49	24.9	.73×.23=.168	59.0	...do........	.20, .17, .19, .20, .20. .19, .32, .55,* .25, .22
5713	6	.993	.373	.370	14,930	40,350	20,660	55,840	2.02	20.2	.75×.20=.150	59.5	...do........	.60,* .21, .21, .19, .14, .14, .17, .14, .11, .11
5714	7	.995	.241	.240	9,760	40,670	14,420	60,080	2.16	21.6	.75×.14=.105	56.2	Silky, lamellar.	.22, .19, .16, .13, .15, .18, .25, .52,* .19, .17

TENSILE TESTS OF STEEL PLATES FROM THE SPRINGFIELD ARMORY, REPRESENTING METAL FOR 3.2-INCH FIELD GUN CARRIAGES.

Form of specimens.



No. of test.	Mark on specimen.	Dimensions in inches.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.						
				Sq. in.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*In.*	*Pr. ct.*	*Inches Sq. in.*	*Pr. ct.*		″ ″ ″ ″ ″ ″ ″ ″
5606	109	1.521	.192	.292	15,800	54,100	22,160	75,890	1.66	20.8	1.24×.13=.161	44.9	Silky	.14, .18, .23, .45*, .20, .18, .16, .12
5607	110	1.533	.205	.314	17,180	54,710	24,540	78,150	1.70	21.1	1.26×.13=.164	47.8	....do	.16, .27, .47*, .20, .18, .15, .15, .12
5608	111	1.521	.212	.322	17,300	53,730	25,290	78,540	1.65	20.6	1.24×.15=.186	42.2	....do	.12, .13, .15, .18, .22, .30, .40*, .15
5609	112	1.525	.213	.323	17,980	55,320	25,240	77,660	1.75	21.9	1.23×.15=.184	43.4	....do	.12, .16, .17, .20, .50*, .25, .20, .15
5610	113	1.522	.205	.312	16,710	53,560	23,970	76,830	1.72	21.5	1.24×.13=.161	48.4	....do	.18, .52*, .22, .18, .18, .17, .17, .10
5611	114	1.531	.203	.311	16,950	54,500	24,060	77,360	1.82	22.8	1.24×.14=.174	44.1	....do	.20 .48*, .20, .20, .19, .21, .19, .15
5612	115	1.516	.206	.312	16,820	53,910	23,950	76,760	1.72	21.5	1.24×.15=.186	40.4	....do	.18, .32*, .32*, .20, .18, .18, .20, .14
5613	116	1.519	.208	.316	16,810	53,200	24,220	76,650	1.88	23.5	1.22×.16=.195	38.3	....do	.18, .50*, .27, .23, .17, .17, .18, .18
5614	117	1.515	.204	.309	17,950	58,090	24,060	77,860	1.90	23.8	1.26×.13=.164	48.9	....do	.12, .16, .22, .48*, .26, .32, .22, .12
5615	118	1.536	.207	.318	17,810	56,010	23,790	74,810	1.52	19.0	1.26×.14=.176	44.7	....do	.18, .48*. .24, .15, .10, .13, .12, .12
5616	119	1.530	.204	.312	Indefinite		40,530	120,900	.82	10.3	1.43×.16=.229	26.6	Silky, interspersed with fine granulation.	.08, .04, .08, .10, .08, .12, .26, .06
5617	120	1.527	.196	.299	16,840	56,320	23,310	77,960	1.60	20.0	1.23×.13=.160	46.5	Silky	.12, .16, .20, .44*, .18, .17, .16, .12
5618	121	1.533	.204	.313	17,400	55,590	24,510	78,310	1.60	20.0	1.27×.14=.178	43.1	....do	.15, .23, .44*, .16, .12, .16, .14, .20
5619	122	1.520	.194	.295	16,650	56,440	22,190	75,220	1.65	20.6	1.26×.14=.176	40.3	....do	.12, .16, .12, .20, .48*. .22, .20, .15
5620	123	1.523	.196	.299	17,800	59,530	23,310	77,960	1.67	20.9	1.25×.13=.162	45.8	....do	.18, .47*, .25. .18, .17, .15, .16, .11
5621	124	1.521	.196	.298	16,690	56,010	23,240	77,990	1.65	20.6	1.27×.12=.152	49.0	....do	.15, .20, .47*, .23, .20, .17, .13. .10
5622	125	1.525	.204	.311	17,570	56,500	24,270	78,040	1.75	21.9	1.22×.14=.171	45.0	....do	.12, .16, .20, .17, .28, .47*, .20, .15
5623	126	1.525	.200	.305	17,260	56,590	22,810	74,790	1.65	20.6	1.23×.15=.184	39.7	....do	.18, .47*, .20, .15, .15, .17, .18, .15
5624	127	1.516	.198	.300	16,050	53,500	21,200	70,670	1.64	20.5	1.23×.13=.160	46.7	....do	.16, .34, .40*, .18, .14, .16, .12, .14
5625	128	1.522	.196	.298	15,920	53,420	22,910	76,880	1.75	21.9	1.23×.13=.160	46.3	....do	.18, .22, .49*, .17, .14, .18, .20, .17
5626	129	1.542	.200	.308	16,510	53,600	23,420	76,040	1.92	24.0	1.23×.13=.160	48.1	....do	.18, .22, .50*, .22, .20, .21, .22, .17
5627	130	1.535	.196	.301	15,970	53,060	21,980	73,020	1.80	22.5	1.29×.12 -.155	48.5	....do	.15, .15, .20, .25, .47*, .23, .20, .15
5628	131	1.532	.191	.293	15,940	54,400	21,430	73,140	1.64	20.5	1.26×.13=.164	44.0	....do	.12, .16, .14, .18, .45*, .25, .20, .14
5629	132	1.530	.194	.297	17,020	57,310	23,190	78,080	1.68	21.0	1.26×.15=.189	36.4	....do	.18, .18, .34*, .34*, .16, .18, .17, .18

TENSILE TESTS OF STEEL PLATES FROM THE SPRINGFIELD ARMORY, REPRESENTING METAL FOR 3.2-INCH FIELD GUN CARRIAGES—Continued.

No. of test.	Mark on specimen.	Dimensions in inches.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.						
				Sq. in.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*In.*	*Pr. ct.*	*Inches. Sq. in.*	*Pr. ct.*		″ ″ ″ ″ ″ ″ ″ ″
5630	133	1.523	.194	.296	17,100	57,970	22,970	77,860	1.65	20.6	1.26×.13=.164	44.4	Silky	.15, .17, .23, .45*, .20, .18, .14, .13
5631	134	1.520	.193	.293	17,350	59,210	23,100	78,840	1.62	20.3	1.26×.13=.164	44.1	....do	.18, .47*, .20, .15, .16, .16, .18, .12
5632	135	1.518	.192	.291	17,600	60,480	22,510	77,350	1.85	23.1	1.24×.12=.149	48.8	....do	.14, .21, .25, .26, .49*, .23, .17, .10
5633	136	1.521	.200	.304	17,920	58,950	22,940	75,460	1.64	20.5	1.22×.14=.171	43.7	....do	.15, .17, .48*, .25, .15, .18, .16, .10
5634	137	1.517	.199	.302	18,390	60,890	24,410	80,830	1.54	19.3	1.26×.13=.164	45.7	....do	.12, .16, .12, .15, .23, .47*, .15, .14
5635	138	1.523	.200	.305	19,400	63,610	25,110	82,330	1.65	20.6	1.24×.13=.161	47.2	....do	.15, .23, .47*, .15, .18, .14, .18. .15
5636	139	1.520	.198	.301	16,950	56,310	22,710	75,450	1.60	20.0	1.25×.13=.162	46.2	....do	.15, .15, .18, .14, .16, .22, .45*, .15
5637	140	1.526	.206	.314	16,680	53,120	23,670	75,380	1.60	20.0	1.23×.14=.172	45.2	....do	.12, .16, .10, .12, .20, .23, .49*, .18
5638	141	1.515	.204	.309	18,700	60,520	24,920	80,650	1.65	20.6	1.24×.13=.161	47.9	....do	.14, .21, .20, .15, .15, .18, .47*, .15
5639	142	1.522	.202	.307	18,810	61,270	24,510	79,840	1.68	21.0	1.27×.13=.165	46.3	....do	.15, .18, .18, .27, .42*, .20, .15, .13
5640	143	1.527	.200	.305	17,940	58,820	24,060	78,890	1.62	20.3	1.26×.14=.176	42.3	....do	.15, .15, .15, .18, .47*, .23, .17, .12
5641	144	1.506	.203	.306	19,000	62,090	25,080	81,960	1.61	20.1	1.24×.15=.186	39.2	....do	.12, .16, .20, .20, .32*, .33*, .17, .11
5642	145	1.521	.197	.300	17,620	58,730	23,460	78,200	1.70	21.3	1.21×.14=.169	43.7	....do	.15, .19, .18, .48*, .22, .20, .16, .12
5643	146	1.519	.200	.304	18,200	59,870	23,970	78,850	1.38	17.3	1.28×.14=.179	41.1	....do	.12, .13, .13, .12, .12, .26, .37*, .13
5644	147	1.516	.201	.305	17,590	57,670	23,710	77,740	1.58	19.8	1.23×.14=.172	43.6	....do	.18, .44*, .25, .15, .16, .12, .15, .13
5645	148	1.517	.197	.299	18,200	60,870	24,490	81,910	1.72	21.5	1.22×.13=.159	46.8	... do	.14, .16, .20, .45*, .28, .19, .18, .12
5646	149	1.525	.200	.305	18,990	62,260	25,040	82,100	1.60	20.0	1.25×.13=.162	46.9	....do	.12, .16. .17, .23, .44*, .20, .16, .12
5647	150	1.529	.197	.301	18,200	60,470	23,960	79,600	1.60	20.0	1.27×.14=.178	40.9	....do	.16. .47*, .22, .15. .15, .15, .18, .12
5648	151	1.526	.197	.301	17,570	58,370	23,660	78,600	1.65	20.6	1.23×.14=.172	42.9	....do	.15, .20, .52*, .23, .18, .12, .15, .10
4649	152	1.523	.196	.299	18,580	62,140	23,680	79,200	1.60	20.0	1.28×.12=.154	48.5	....do	.09, .19, .20, .47*, .20, .15, .18, .12
4650	153	1.534	.197	.302	18,970	62,810	24,630	81,560	1.58	19.8	1.28×.12=.154	49.0	....do	.14, .18, .44* .27, .15, .14. .16, .10
4651	154	1.528	.194	.296	17,400	58,780	22,910	77,400	1.61	20.1	1.27×.12=.152	48.6	....do	.15, .20, .46*, .19, .18, .17, .15, .11
4652	155	1.526	.205	.313	18,600	59,420	24,620	78,660	1.35	16.9	1.24×.15=.186	40.6	....do	.14, .21, .47*, .18, .10, .08, .08, .09
4653	156	1.521	.194	.295	17,150	58,140	22,710	76,980	1.55	19.4	1.25×.14=.175	40.7	....do	.13, .12, .15, .14, .16, .48*. .22, .15
4654	157	1.531	.196	.300	18,100	60,330	23,740	79,130	1.78	22.3	1.23×.13=.160	46.7	....do	.12, .13, .15, .17, .28, .53*, .24, .16
4655	158	1.519	.198	.301	18,420	61,200	23,980	79,670	1.72	21.5	1.26×.12=.151	49.8	....do	.15, .20, .48*, .24, .18, .20, .12, .15

CHEMICAL COMPOSITION OF STEEL PLATES FROM THE SPRINGFIELD ARMORY, REPRESENTING METAL FOR 3.2-INCH FIELD GUN CARRIAGES.

Tension test number.	Marks.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus	Copper.	Remarks.
		Total.	Graphitic.	Combined.						
5423	78	....	....	0.261	1.848	0.033	....	....	......	Tension tests of these specimens published in Report of Tests, 1891.
5425	80	....	....	0.218	1.200	0.021	....	....	......	
5426	81	....	....	0.217	1.130	0.035	....	....	......	
5440	95	....	....	0.187	1.180	0.030	....	....	......	
5442	97	....	....	0.290	2.128	0.032	....	....	......	
5443	98	....	....	0.200	1.142	0.030	....	....	......	
5447	102	....	....	0.160	0.896	0.034	....	....	......	
5612	115	0.170	0.010	0.160	....	0.038	0.1 3	0.064	......	
5616	119	0.400	0.011	0.389	....	0.101	0.103	0.058	......	

STEEL FROM PISTON ROD FOR 12-INCH MORTAR CARRIAGE.

No. 4571.

Marks, P R, B. L.;
Diameter, ″.500.
Sectional area, .196 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
196	1,000	0.	0.	0.	.0	Initial load.
980	5,000	.000100	.000100	0.	....	
1,960	10,000	.000350	.000250	....	....	
2,940	15,000	.000500	.000150	....	....	
3,920	20,000	.000600	.000100	....	....	
4,900	25,000	.000850	.000250	0.	....	
5,880	30,000	.000950	.000100	....	....	
6,860	35,000	.001100	.000150	....	....	
7,840	40,000	.001200	.000100	0.	....	
8,820	45,000	.001350	.000150	....	....	
9,800	50,000	.001550	.000200	0.	....	Elastic limit.
9,996	51,000	.009700	.008150	....	....	
10,192	52,000	.010050	.000350	....	....	
10,388	53,000	.010400	.000350	....	....	
10,584	54,000	.011250	.000850	....	....	
10,780	55,000	.012500	.001250	....	....	
18,110	92,400	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,400
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.210
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.090
Reduction in area after rupture, per cent of original section		32.6
Position of rupture		″.9 from neck
Character of broken surface		silky
Elongation of inch sections		″.26*, ″.16

No. 4572.

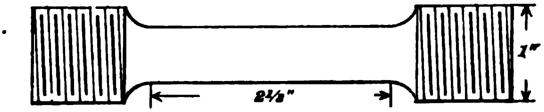
Marks, P R_1 M L_3
Diameter, ″.500.
Sectional area, 196 square inches.
Gagued length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
196	1,000	.0	.0	.0	.0	Initial load.
980	5,000	.000100	.000100	.0	....	
1,960	10,000	.000200	.000100	....	....	
2,940	15,000	.000350	.000150	....	....	
3,920	20,000	.000600	.000250	....	....	
4,900	25,000	.000850	.000250	....	....	
5,880	30,000	.001100	.000250	.000050	.000050	
6,860	35,000	.001300	.000200	....	....	
7,840	40,000	.001500	.000200	.000050	.0	
8,820	45,000	.001650	.000050	....	....	
9.408	48,000	.001800	.000150	....	....	
9,604	49,000	.001850	.000050	....	....	Elastic limit.
9,800	50,000	.003250	.001400	....	....	
9,996	51,000	.012750	.009500	....	....	
10,192	52,000	.013250	.000500	....	....	
10,388	53,000	.013800	.000550	....	....	
10,584	54,000	.014750	.000950	....	....	
10,780	55,000	.016000	.001250	....	....	
17,490	89,230	....	....	....	....	Tensile strength.

General summary.

Tensile strength, per square inch of original section	pounds..	89,230
Elastic limit, per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.260
Elongation per inch under strain at elastic limit	do..	.001850
Reduction in diameter at point of rupture	do..	.150
Reduction in area after rupture, per centum of original section		51.0
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.37*, ″.15

STEEL FROM BAIL FOR 10-INCH B. L. RIFLE.



No. 5547.

Diameter, ''.564.
Sectional area, .25 square inch.
Elastic limit, 12,540 pounds = 50,160 pounds per square inch.
Tensile strength, 15,910 pounds = 73,640 pounds per square inch.
Elongation in 2 inches, ''.76=38.0 per cent.
Elongation of inch sections, ''.23, ''.53.*
Diameter at fracture, ''.34; area .091 square inch.
Contraction of area, 63.6 per cent.
Appearance of fracture, fine silky.

No. 4577.

Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 2''.

Applied load.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000350	.000250	....	....	
5,000	20,000	.000600	.000250	....	....	
7,500	30,000	.000950	.000350	0.	....	
8,750	35,000	.001100	.000150	....	....	
9,500	38,000	.001300	.000200	....	....	
9,750	39,000	.001350	.000050	....	....	Elastic limit.
10,000	40,000	.005350	.004000	....	....	
10,250	41,000	.007000	.001650	....	....	
10,500	42,000	.018000	.011000	....	....	
10,750	43,000	.019000	.001000	....	....	
11,000	44,000	.020250	.001250	....	....	
15,710	62,840	....	....	....	....	Tensile strength.

General summary.

Tensile strength, per square inch of original section	pounds	62,840
Elastic limit, per square inch of original section	do	39,000
Elongation per inch after rupture	inch	.350
Elongation per inch under strain at elastic limit	do	.001350
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		''.35*, ''.35*

RIFLE-BARREL STEEL FROM SPRINGFIELD ARMORY

FOR

BARRELS .30 AND .45 CALIBER.

No. 4583.

Marks, .
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000067	.000067	....	....	
2, 500	10, 000	.000267	.000200	....	....	
3, 750	15, 000	.000433	.000166	....	....	
5, 000	20, 000	.000633	.000200	....	....	
6, 250	25, 000	.000867	.000234	....	....	
7, 500	30, 000	.001033	.000166	0.	....	
8, 750	35, 000	.001200	.000167	....	....	
10, 000	40, 000	.001400	.000200	.000033	.000033	
11, 250	45, 000	.001567	.000167	....	....	
12, 500	50, 000	.001733	.000166	.000033	0.	
13, 500	54, 000	.001938 .008000	.000200 .006067	....	....	Elastic limit.
13, 750	55, 000	.008200	.000200	....	....	
14, 000	56, 000	.008600	.000400	....	....	
14, 250	57, 000	.009000	.000400	....	....	
14, 500	58, 000	.009833	.000833	....	....	
14, 750	59, 000	.010333	.000500	....	....	
15, 000	60, 000	.011000	.000667	....	....	
26, 690	106, 760	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section..................................pounds..	106, 760
Elastic limit per square inch of original section..................................do...	54, 000
Elongation per inch after rupture..................................do...	.1667
Elongation per inch under strain at elastic limit..................................inch..	.001993
Reduction in diameter at point of rupture..................................do...	.084
Reduction in area after rupture, per centum of original section..................................	27.6
Position of rupture	1″.18 from neck
Character of broken surface................	granular, radiating from a dull spot at the circumference
Elongation of inch sections..................................	″.11, ″.21*, ″.18*

No. 4589.

Marks, • •
Diameter, ''.564.
Sectional area, .25 square inch.
Gauged length, 3''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	....	....	
2,500	10,000	.000267	.000200	....	....	
3,750	15,000	.000433	.000166	....	....	
5,000	20,000	.000633	.000200	....	....	
6,250	25,000	.000833	.000200	....	....	
7,500	30,000	.001000	.000167	....	....	
8,750	35,000	.001167	.000167	....	....	
10,000	40,000	.001333	.000166	0.	....	
11,250	45,000	.001500	.000167	....	....	
12,500	50,000	.001700	.000200	0.	....	
13,000	52,000	.001767	.000067	....	....	
13,250	53,000	.001833	.000066	....	....	
13,500	54,000	.001900	.000067	....	....	
13,750	55,000	.001933	.000033	....	....	
14,000	56,000	.001967	.000034	....	....	
14,250	57,000	.002033	.000066	....	....	Elastic limit.
14,500	58,000	.007833	.005800	....	....	
14,750	59,000	.008267	.000434	....	....	
15,000	60,000	.008700	.000433	....	....	
15.250	61,000	.008933	.000233	....	....	
15,500	62,000	.009433	.000500	....	....	
28,470	113,880	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	113,880
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	1467
Elongation per inch under strain at elastic limit	do...	.002033
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		24.6
Position of rupture		1''.10 from neck
Character of broken surface		granular radiating from a dull spot at the circumference
Elongation of inch sections		''.10, ''.17, ''.17*

No. 4590.

Marks, . . .
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	....	....	
2,500	10,000	.000267	.000200	....	....	
3,750	15,000	.000433	.000166	....	....	
5,000	20,000	.000600	.000167	....	....	
6,250	25,000	.000767	.000167	....	....	
7,500	30,000	.000933	.000166	....	....	
8,750	35,000	.001100	.000167	....	....	
10,000	40,000	.001300	.000200	0.	....	
11,250	45,000	.001500	.000200	....	....	
12,500	50,000	.001700	.000200	....	....	
12,750	51,000	.001733	.000033	....	....	
13,000	52,000	.001767	.000034	....	....	
13,250	53,000	.001800	.000033	....	....	
13,500	54,000	.001833	.000033	....	....	
13,750	55,000	.001900	.000067	....	....	
14,000	56,000	.001933	.000033	....	....	
14,250	57,000	.001967	.000034	....	....	Elastic limit.
14,500	58,000	.002267	.000300	....	....	
14,750	59,000	.012733	.000466	....	....	
15,000	60,000	.013200	.000467	....	....	
15,250	61,000	.013900	.000700	....	....	
15,500	62,000	.014667	.000767	....	....	
25,050	100,200	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,200
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	.1733
Elongation per inch under strain at elastic limit	do...	.001967
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		1″.20 from neck
Character of broken surface		silky, in part interspersed with fine granulation
Elongation of inch sections		″.10, ″.22*, ″.20*

No. 4591.

Marks . . . .
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000300	.000200	....	....	
3,750	15,000	.000467	.000167	....	....	
5,000	20,000	.000633	.000166	....	....	
6,250	25,000	.000800	.000167	....	....	
7,500	30,000	.000967	.000167	....	....	
8,750	35,000	.001167	.000200	....	....	
10,000	40,000	.001367	.000200	0.	....	
11,250	45,000	.001533	.000166	....	....	
12,500	50,000	.001700	.000167	....	....	
12,750	51,000	.001733	.000033	....	....	Elastic limit.
13,000	52,000	.021600	.019867	....	....	
13,250	53,000	.022333	.000733	....	....	
13,500	54,000	.024067	.001734	....	....	
13,750	55,000	.025067	.001000	....	....	
14,000	56,000	.026500	.001433	....	....	
14,250	57,000	.028067	.001567	....	....	
14,500	58,000	.029833	.001766	....	....	
14,750	59,000	.032000	.002167	....	....	
15,000	60,000	.034000	.002000	....	....	
19,580	78,320	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	78,320
Elastic limit, per square inch of original section	do	51,000
Elongation per inch after rupture	inch	.260
Elongation per inch under strain of elastic limit	do	.001733
Reduction in diameter at point of rupture	do	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		1″.45 from neck.
Character of broken surface		fine silky.
Elongation of inch sections		″.17, ″.37*, ″.24

No. 4623.

Mark A.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000300	.000200			
5,000	20,000	.000667	.000367			
7,500	30,000	.001000	.000333	—.000033	—.000033	
8,750	35,000	.001167	.000167			
10,000	40,000	.001367	.000200	—.000033	0.	
11,250	45,000	.001533	.000166			
12,500	50,000	.001700	.000167	0.	.000033	
12,750	51,000	.001733	.000033			
13,000	52,000	.001767	.000034			
13,250	53,000	.001800	.000033			
13,500	54,000	.001833	.000033			
13,750	55,000	.001867	.000034			
14,000	56,000	.001900	.000033			Elastic limit.
14,250	57,000	.033333	.031433			
14,500	58,000	.036333	.003000			
14,750	59,000	.038000	.001667			
15,000	60,000	.042000	.004000			
15,250	61,000	.045667	.003667			
17,860	71,440					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	71,440
Elastic limit per square inch of original section	do	56,000
Elongation per inch after rupture	inch	.2600
Elongation per inch under strain at elastic limit	do	.001900
Reduction in diameter at point of rupture	do	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture		1″.5 from neck
Character of broken surface		silky
Elongation of inch sections		″.20, ″.40*, ″.16

No. 4624.

Marks, R I.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000333	.000233			
5,000	20,000	.000667	.000334			
7,500	30,000	.001033	.000366			
10,000	40,000	.001367	.000334	0.		
11,250	45,000	.001567	.000200			
12,500	50,000	.001733	.000166	0.		
13,750	55,000	.001900	.000167			
15,000	60,000	.002100	.000200	0.		
15,500	62,000	.002133	.000033			
16,000	64,000	.002200	.000067			
16,500	66,000	.002267	.000067			
17,000	68,000	.002333	.000066			
17,500	70,000	.002400	.000067			
18,000	72,000	.002433	.000033			Elastic limit.
18,500	74,000	.002567	.000134			
19,000	76,000	.002667	.000100			
19,500	78,000	.002767	.000100			
19,750	79,000	.015667	.012900			
20,000	80,000	.016333	.000666			
20,250	81,000	.017167	.000834			
20,500	82,000	.018500	.001333			
28,320	113,280					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	113,280
Elastic limit per square inch of original section	do	72,000
Elongation per inch after rupture	inch	.1500
Elongation per inch under strain at elastic limit	do	.002433
Reduction in diameter at point of rupture	do	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.19 from neck
Character of broken surface		silky, cup-shaped
Elongation of inch sections		″.08, ″.18*, ″.19*

No. 4625.

Marks, R I_2
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	....	
2,500	10,000	.000333	.000200	....	....	
5,000	20,000	.000700	.000367	....	....	
7,500	30,000	.001000	.000300	....	....	
10,000	40,000	.001367	.000367	.000033	.000033	
11,250	45,000	.001567	.000200	....	....	
12,500	50,000	.001767	.000200	.000033	0.	
13,750	55,000	.001933	.000166	....	....	
15,000	60,000	.002133	.000200	.000033	0.	
15,500	62,000	.002233	.000100	....	....	
16,000	64,000	.002300 .022400	.000067 .010100	....	....	Elastic limit.
16,250	65,000	.024000	.001600	....	....	
16,500	66,000	.025600	.001600	....	....	
16,750	67,000	.027267	.001667	....	....	
17,000	68,000	.028333	.001066	....	....	
17,250	69,000	.030333	.002000	....	....	
17,500	70,000	.032333	.002000	....	....	
21,840	87,360	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	87,360
Elastic limit per square inch of original section	do	64,000
Elongation per inch after rupture	inch	.2300
Elongation per inch under strain at elastic limit	do	.002300
Reduction in diameter at point of rupture	do	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		at middle of stem
Character of broken surface		fine silky, cup shaped
Elongation of inch sections		″.14, ″.41*, ″.14

No. 4675.

Marks, A I_1
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000300	.000200			
5,000	20,000	.000633	.000333			
7,500	30,000	.000967	.000334			
8,750	35,000	.001200	.000233	0.		
10,000	40,000	.001333	.000133	0.		
11,250	45,000	.001567	.000234			Elastic limit; load fell.
10,500	42,000	.008467	.006900			
10,750	43,000	.008667	.000200			
11,000	44,000	.008900	.000233			
11,250	45,000	.009333	.000433			
11,500	46,000	.010433	.001100			
11,750	47,000	.011067	.000634			
12,000	48,000	.012333	.001266			
12,250	49,000	.013067	.000734			
12,500	50,000	.013667	.000600			
13,000	52,000	.015933	.002266			
13,500	54,000	.018333	.002400			
14,000	56,000	.020400	.002067			
14,500	58,000	.022800	.002400			
15,000	60,000	.025000	.002200			
15,500	62,000	.028167	.003167			
16,000	64,000	.031000	.002833			
16,500	66,000	.0350	.0040			
17,000	68,000	.0400	.0050			
17,500	70,000	.0467	.0067			
18,000	72,000	.0500	.0033			
18,500	74,000	.0567	.0067			
19,000	76,000	.0667	.0100			
19,500	78,000	.0733	.0066			
20,000	80,000	.0867	.0134			
20,500	82,000	.1067	.0200			
21,000	84,000	.1367	.0300			
21,280	85,120					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	85,120
Elastic limit per square inch of original section	do	45,000
Elongation per inch after rupture	inch	.2600
Elongation per inch under strain at elastic limit	do	.001567
Reduction in diameter at point of rupture	do	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		.″20, .″40*, .″18

Chemical composition.

	Per cent.
Total carbon	0.409
Graphitic carbon	0.023
Combined carbon	0.386
Manganese	0.555
Silicon	0.136
Sulphur	0.042
Phosphorus	0.052

No. 4676.

Marks, A I_3
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000333	.000200			
5,000	20,000	.000700	.000367			
7,500	30,000	.001133	.000433			
8,750	35,000	.001300	.000167	.000033	.000033	
10,000	40,000	.001500	.000200	.000067	.000034	
11,250	45,000	.001667	.000167			Elastic limit; load fell.
10,250	41,000	.006000	.004333			
10,500	42,000	.008667	.002667			
10,750	43,000	.009033	.000366			
11,000	44,000	.009633	.000600			
11,250	45,000	.010267	.000634			
11,500	46,000	.011000	.000733			
11,750	47,000	.011667	.000667			
12,000	48,000	.012800	.001133			
12,500	50,000	.014667	.001867			
13,000	52,000	.016667	.002000			
13,500	54,000	.018667	.002000			
14,000	56,000	.021000	.002333			
14,500	58,000	.023333	.002333			
15,000	60,000	.027000	.003667			
15,500	62,000	.029333	.002333			
16,000	64,000	.032000	.002667			
16,500	66,000	.035667	.003667			
17,000	68,000	.039333	.003666			
17.500	70,000	.044000	.004667			
18,000	72,000	.0467	.0027			
18,500	74,000	.0500	.0033			
19,000	76,000	.0600	.0100			
19,500	78,000	.0733	.0133			
20,000	80,000	.0867	.0134			
20,500	82,009	.1133	.0266			
21,000	84,000	.1700	.0567			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,000
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.2433
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		at middle of stem
Character of broken surface		silky.
Elongation of inch sections		″16, .″30, .″18

No. 4723.

Marks, 2.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.		
2,500	10,000	.000233	.000166			
5,000	20,000	.000567	.000334			
7,500	30,000	.000933	.000366	0.		
8,750	35,000	.001067	.000134			
10,000	40,000	.001233	.000166	.000033	.000033	
11,250	45,000	.001433	.000200			
12,500	50,000	.001667	.000234	.000033	0.	
12,750	51,000	.001700	.000033			
13,000	52,000	.001733	.000033			Elastic limit; load fell.
12,500	50,000	.006667	.004934			
12,750	51,000	.018667	.012000			
13,000	52,000	.019667	.001000			
13,500	54,000	.022000	.002333			
14,000	56,000	.026000	.004000			
14,500	58,000	.029333	.003333			
15,000	60,000	.033000	.003667			
15,500	62,000	.038400	.005400			
16,000	64,000	.044333	.005933			
16,500	66,000	.049667	.005334			
17,000	68,000	.058000	.008333			
17,500	70,000	.0700	.0120			
18,000	72,000	.0867	.0167			
18,500	74,000	.1033	.0166			
19,000	76,000	.1333	.0300			
19,310	77,240					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	77,240
Elastic limit per square inch of original section	do	52,000
Elongation per inch after rupture	inch	.2933
Elongation per inch under strain at elastic limit	do	.001733
Reduction in diameter at point of rupture	do	.194
Reduction in area after rupture, per cent of original section		57.0
Position of rupture		1″.8 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.18, ″.50*, ″.20

Chemical composition.

	Per cent.
Total carbon	0.320
Graphitic carbon	0.080
Combined carbon	0.240
Manganese	1.342
Silicon	0.025
Sulphur	0.080
Phosphorus	0.045

No. 4724.

Marks, 2.
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	....	....	
10,000	40,000	.001367	.000367	0.	....	
11,250	45,000	.001533	.000166	....	....	
12,500	50,000	.001700	.000167	0.	....	
12,750	51,000	.001733	.000033	....	....	
13,000	52,000	.001767	.000034	....	....	
13,250	53,000	.001800	.000033	....	....	
13,500	54,000	.001833	.000033	....	....	
13,750	55,000	.001867	.000034	....	....	Elastic limit.
14,000	56,000	.002000	.000133	....	....	Load fell.
12,750	51,000	.004067	.004067	....	....	
13,000	52,000	.008333	.002266	....	....	
13,250	53,000	.019333	.011000	....	....	
13,500	54,000	.022333	.003000	....	....	
13,750	55,000	.022933	.000600	....	....	
14,000	56,000	.024000	.001067	....	....	
14,500	58,000	.027733	.003733	....	....	
15,000	60,000	.032500	.004767	....	....	
15,500	62,000	.037167	.004667	....	....	
16,000	64,000	.041667	.004500	....	....	
16,500	66,000	.048300	.006633	....	....	
17,000	68,000	.055000	.006700	....	....	
17,500	70,000	.064000	.009000	....	....	
18,000	72,000	.0767	.0127	....	....	
18,500	74,000	.0933	.0166	....	....	
19,000	76,000	.1200	.0267	....	....	
19,420	77,680	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds..	77,680
Elastic limit per square inch of original section............do...	55,000
Elongation per inch after rupture............inch..	.2833
Elongation per inch under strain at elastic limit ....do...	.001867
Reduction in diameter at point of rupture............do...	.185
Reduction in area after rupture, per cent of original section............	54.6
Position of rupture............	1″.8 from neck
Character of broken surface............	fine silky
Elongation of inch sections	″.18, ″.48*, ″.19

No. 4725.

Marks, 4.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000333	.000233	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	....	....	
10,000	40,000	.001333	.000333	0.	....	
12,500	50,000	.001667	.000334	0.	....	
12,750	51,000	.001700	.000033	....	....	
13,000	52,000	.001733	.000033	....	....	
13,250	53,000	.001767	.000034	....	....	
13,500	54,000	.001800	.000033	....	....	
13,750	55,000	.001833	.000033	....	....	
14,000	56,000	.001900	.000067	....	....	
14,250	57,000	.001967	.000067	....	....	
14,500	58,000	.002033	.000066	....	....	
14,750	59,000	.002067	.000034	....	....	Elastic limit.
15,000	60,000	.002200	.000133	.000267	.000267	
15,250	61,000	.002333	.000133	....	....	
15,500	62,000	.002467	.000134	....	....	
15,750	63,000	.002600	.000133	....	....	
16,000	64,000	.004333	.001733	....	....	
16,250	65,000	.005400	.001067	....	....	
16,500	66,000	.007000	.001600	....	....	
17,000	68,000	.011533	.004533	....	....	
17,500	70,000	.014333	.002800	....	....	
18,000	72,000	.018333	.004000	....	....	
18,500	74,000	.023000	.004667	....	....	
19,000	76,000	.029000	.006000	....	....	
19,500	78,000	.034667	.005667	....	....	
20,000	80,000	.041933	.007266	....	....	
20,500	82,000	.050000	.008067	....	....	
21,000	84,000	.061667	.011667	....	....	
21,500	86,000	.0800	.018333	....	....	
21,950	87,800	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,800
Elastic limit per square inch of original section	do...	59.000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.002067
Reduction in diameter at point of rupture	do...	.204
Reduction in area after rupture, per cent of original section		59.3
Position of rupture		″.95 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.39*, ″.12, ″.11

Chemical composition.

	Per cent.
Total carbon	0.277
Graphitic carbon	0.077
Combined carbon	0.200
Manganese	0.751
Silicon	0.024
Sulphur	0.117
Phosphorus	0.049

No. 4726.

Marks, 4.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000300	.000200	....	....	
5,000	20,000	.000633	.000333	....	....	
7,500	30,000	.000967	.000334	....	....	
10,000	40,000	.001333	.000366	0.	....	
12,500	50,000	.001700	.000367	....	....	
13,750	55,000	.001900	.000200	....	....	
14,000	56,000	.001967	.000067	....	....	
14,250	57,000	.002033	.000067	....	....	
14,500	58,000	.002100	.000067	....	....	
14,750	59,000	.002167	.000067	....	....	Elastic limit.
15,000	60,000	.002333	.000166	.000333	.000333	
15,250	61,000	.002467	.000134	....	....	
15,500	62,000	.004333	.009866	....	....	
15,750	63,000	.006933	.002600	....	....	
16,000	64,000	.008333	.001400	....	....	
16,250	65,000	.009667	.001334	....	....	
16,500	66,000	.011333	.001666	....	....	
17,000	68,000	.015000	.003667	....	....	
17,500	70,000	.020333	.005333	....	....	
18,000	72,000	.023000	.002667	....	....	
18,500	74,000	.028000	.005000	....	....	
19,000	76,000	.034333	.006333	....	....	
19,500	78,000	.040333	.006000	....	....	
20,000	80,000	.048667	.008334	....	....	
20,500	82,000	.061667	.013000	....	....	
21,000	84,000	.076667	.015000	....	....	
21,500	86,000	.14	.063333	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	86,000
Elastic limit per square inch of original section	do	59,000
Elongation per inch after rupture	inch	.2167
Elongation per inch under strain at elastic limit	do	.002167
Reduction in diameter at point of rupture	do	.204
Reduction in area after rupture, per cent of original section		59.3
Position of rupture		″.75 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.37*, ″.14, ″.14

No. 4727.

Marks, 6.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.		
2,500	10,000	.000267	.000200			
5,000	20,000	.000633	.000366			
7,500	30,000	.001000	.000367			
10,000	40,000	.001367	.000367	0.		
12,500	50,000	.001700	.000333	0.		
13,750	55,000	.001867	.000167			
15,000	60,000	.002033	.000163	.000033	.000033	
16,250	65,000	.002233	.000200			
17,500	70,000	.002433	.000200	.000033	0.	
17.750	71,000	.002467	.000034			
18,000	72,000	.002533	.000066			
18,250	73,000	.002600	.000067			
18,500	74,000	.002667	.000067			
18,750	75,000	.002700	.000033			
19,000	76,000	.002733	.000033			
19,250	77,000	.002767	.000034			
19,500	78,000	.002800	.000033			
19,750	79,000	.002867	.000067			Elastic limit.
20.000	80.000	.003000	.000133	.000167	.000133	
20.250	81,000	.003033	.000033			
20.500	82,000	.003067	.00 034			
20,750	83,000	.003133	.000066			
21,000	84,000	.003200	.000067			
21,250	85,000	.003333	.000133	.000367	.000200	
21.500	86,000	.003400	.000067			
21,750	87,000	.003500	.000100			
22,000	88,000	.003667	.000167			
22.250	89,000	.003767	.000100			
22,500	90,000	.004133	.000366	.000933	.000566	
22,750	91,000	.004333	.000200			
23,000	92,000	.004633	.000300			
23,250	93,000	.005000	.000367			
23,500	94,000	.005800	.000800			
23,750	95,000	.007000	.001200			
24,000	96,000	.007667	.000667			
24,250	97,000	.008667	.001000			
24,500	98,000	.012167	.003500			
24,750	99,000	.013333	.001166			
25,000	100,000	.016333	.003000	.012300	.011367	
250	1,000					Rested under this load twenty minutes.
25,250	101,000	.016733	.000100			
25,500	102,000	.018000	.001267			
25,750	103,000	.022000	.004000			
26,000	104,000	.027000	.005000			
26,250	105,000	.029667	.002667			
26,500	106,000	.0400	.010333			
27.000	108,000	.0433	.0033			
27.500	110,000	.0600	.0167			
27,910	111,640					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,640
Elastic limit per square inch of original section	do...	79.000
Elongation per inch after rupture	inch..	.1567
Elongation per inch under strain at elastic limit	do...	.002867
Reduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		″.8 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.05, ″.09, ″.23

No. 4728.

Marks, 6.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000067	.000067	0.	....	
2, 500	10, 000	.000267	.000200	....	....	
5, 000	20, 000	.000633	.000366	....	....	
7, 500	30, 000	.001000	.000367	....	....	
10, 000	40, 000	.001333	.000333	0.	....	
12, 500	50, 000	.001667	.000334	....	....	
15, 000	60, 000	.002000	.000333	0.	....	
16, 250	65, 000	.002167	.000167	....	....	
17, 500	70, 000	.002333	.000166	0.	....	
18, 750	75, 000	.002600	.000267	.000033	.000033	
19, 000	76, 000	.002633	.000033	....	....	
19, 250	77, 000	.002667	.000034	....	....	
19, 500	78, 000	.002700	.000033	....	....	
19, 750	79, 000	.002733	.000033	....	....	Elastic limit.
20, 000	80, 000	.002833	.000100	.000100	.000067	
20, 250	81, 000	.002933	.000100	....	....	
20, 500	82, 000	.002967	.000034	....	....	
20, 750	83, 000	.003000	.000033	....	....	
21, 000	84, 000	.003033	.000033	....	....	
21, 250	85, 000	.003167	.000134	.000267	.000167	
21, 500	86, 000	.003300	.000133	....	....	
21, 750	87, 000	.003333	.000033	....	....	
22, 000	88, 000	.003367	.000034	....	....	
22, 250	89, 000	.003433	.000066	....	....	
22, 500	90, 000	.003733	.000300	.000633	.000366	
22, 750	91, 000	.003867	.000134	....	....	
23, 000	92, 000	.003967	.000100	....	....	
23, 250	93, 000	.004167	.000200	....	....	
23, 500	94, 000	.004700	.000533	....	....	
23, 750	95, 000	.005000	.000300	....	....	
24, 000	96, 000	.005667	.000667	....	....	
24, 250	97, 000	.006833	.001166	....	....	
24, 500	98, 000	.008667	.001834	....	....	
24, 750	99, 000	.009333	.000666	....	....	
25, 000	100, 000	.010833	.001500	.007067	.006434	
25, 250	101, 000	.011667	.000834	....	....	
25, 500	102, 000	.014000	002333	....	....	
25, 750	103, 000	.016333	.002333	....	....	
26, 000	104, 000	.019833	.003500	....	....	
26, 250	105, 000	.022400	.002567	....	....	
26, 500	106, 000	.027000	.004600	....	....	
26, 750	107, 000	.028333	.001333	....	....	
27, 000	108, 000	.033967	.005634	....	....	
27, 250	109, 000	.035333	.001366	....	....	
27, 500	110, 000	.042167	.006834	....	....	
28, 000	112, 000	.0600	.017833	....	....	
28, 300	113, 200	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	113, 200
Elastic limit per square inch of original section	do...	79, 000
Elongation per inch after rupture	inch..	.1333
Elongation per inch under strain at elastic limit	do...	.002733
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		″.6 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.03, ″.06, ″.31*

Chemical composition.

	Per cent.
Total carbon	0.324
Graphitic carbon	0.059
Combined carbon	0.265
Manganese	1.349
Silicon	0.033
Sulphur	0.075
Phosphorus	0.045

No. 4741.

Marks, 7.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	....	
2,500	10,000	.000367	.000234	....	....	
5,000	20,000	.000667	.000300	....	....	
7,500	30,000	.001033	.000366	0.	....	
10,000	40,000	.001400	.000367	0.	....	
12,500	50,000	.001733	.000333	0.	....	
15,000	60,000	.002133	.000400	....	....	
17,500	70,000	.002467	.000334	....	....	
20,000	80,000	.002867	.000400	0.	....	
21,250	85,000	.003000	.000133	....	....	
21,500	86,000	.003067	.000067	....	....	Elastic limit not well defined.
21,750	87,000	.003167	.000100	....	....	
22,000	88,000	.003267	.000100	....	....	
22,250	89,000	.003333	.000066	....	....	
22,500	90,000	.004000	.000667	.000800	.000800	
22,750	91,000	.004400	.000400	....	....	
23,000	92,000	.005033	.000633	....	....	
23,250	93,000	.006033	.001000	....	....	
23,500	94,000	.007167	.001134	....	....	
23,750	95,000	.009667	.002500	....	....	
24,000	96,000	.010700	.001033	....	....	
24,250	97,000	.012167	.001467	....	....	
24,500	98,000	.015000	.002833	....	....	
24,750	99,000	.016667	.001667	....	....	
25,000	100,000	.019333	.002666	....	....	
26,000	104,000	.0267	.007367	....	....	
27,000	108,000	.0400	.0133	....	....	
28,000	112,000	.0700	.0300	....	....	
28,040	112,160	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section......pounds..	112,160
Elastic limit per square inch of original section......do...	86,000
Elongation per inch after rupture......inch..	.1560
Elongation per inch under strain at elastic limit......do...	.003067
Reduction in diameter at point of rupture......do...	.184
Reduction in area after rupture, per cent of original section......	54.6
Position of rupture......	″.5 from neck
Character of broken surface......	fine silky
Elongation of inch sections......	″.34*, ″.06, ″.05

No. 4742.

Marks, 7.
Diameter, ″.564.
Sectional area, 25 square inches.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100			
2,500	10,000	.000333	.000233			
5,000	20,000	.000667	.000334			
7,500	30,000	.001000	.000333			
10,000	40,000	.001367	.000367	0.		
12,500	50,000	.001700	.000333			
15,000	60,000	.002033	.000333	.000033	.000033	
17,500	70,000	.002400	.000367			
19,500	78,000	.002667	.000267			
19,750	79,000	.002767	.000100			
20,000	80,000	.002867	.000100	.000067	.000034	
20,250	81,000	.002900	.000033			
20,500	82,000	.002967	.000067			
20,750	83,000	.003000	.000033			
21,000	84,000	.003033	.000033			
21,250	85,000	.003067	.000034			Elastic limit.
21,500	86,000	.003167	.000100			
21,750	87,000	.003300	.000133			
22,000	88,000	.003400	.000100			
22,250	89,000	.003500	.000100			
22,500	90,000	.003667	.000167	.000467	.000400	
22,750	91,000	.003933	.000266			
23,000	92,000	.004133	.000200			
23,250	93,000	.004600	.000467			
23,500	94,000	.005000	.000400			
23,750	95,000	.005767	.000767			
24,000	96,000	.007333	.001566			
24,250	97,000	.008933	.001600			
24,500	98,000	.011367	.002434			
24,750	99,000	.013267	.001900			
25,000	100,000	.016000	.002733			
25,250	101,000	.017600	.001600			
25,500	102,000	.020600	.003000			
25,750	103,000	.022667	.002067			
26,000	104,000	.024933	.002266			
26,250	105,000	.027000	.002067			
26,500	106,000	.030000	.003000			
26,750	107,000	.032667	.002667			
27,000	108,000	.035667	.003000			
27,250	109,000	.038333	.002666			
27,500	110,000	.044667	.006334			
28,000	112,000	.0567	.012033			
28,500	114,000	.0733	.0166			
28,740	114,960					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	114,960
Elastic limit per square inch of original section	do...	85,000
Elongation per inch after rupture	inch..	.1833
Elongation per inch under strain at elastic limit	do...	.003067
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per cent of original section		57.0
Position of rupture		1″.06 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.35*, ″.12, ″.08

Chemical composition.

	Per cent.
Total carbon	0.324
Graphitic carbon	0.014
Combined carbon	0.310
Manganese	0.601
Silicon	0.167
Sulphur	0.034
Phosphorus	0.077

No. 4743.

Marks, 8.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied load.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	....	
2,500	10,000	.000333	.000200	....	....	
5,000	20,000	.000700	.000367	....	....	
7,500	30,000	.001033	.000333	....	....	
10,000	40,000	.001367	.000334	0.	....	
12,500	50,000	.001700	.000333	....	....	
15,000	60,000	.002067	.000367	0.	....	
17,500	70,000	.002433	.000333	....	....	
20,600	80,000	.002800	.000367	0.	....	
22,500	90,000	.003233	.000433	0.	....	
25,000	100,000	.003667	.000434	.000133	.000133	
25,250	101,000	.003700	.000033	....	....	
25,500	102,000	.003667	.000067	....	....	
25,750	103,000	.003833	.000066	....	....	
26,000	104,000	.003933	.000100	....	....	
26,250	105,000	.004000	.000067	....	....	
26,500	106,000	.004033	.000033	....	....	
26,750	107,000	.004067	.000034	....	....	Elastic limit.
27,000	108,000	.004200	.000133	....	....	
27,250	109,000	.004300	.000100	....	....	
27,500	110,000	.004367	.000067	.000567	.000434	
27,750	111,000	.004500	.000133	....	....	
28,000	112,000	.004367	.000167	....	....	
28.250	113,000	.004767	.000100	....	....	
28,500	114,000	.005000	.000233	....	....	
28,750	115,000	.005167	.000167	....	....	
29,000	116,000	.005400	.000233	....	....	
29,250	117,000	.005700	.000300	....	....	
20,500	118.000	.006000	.000300	....	....	
29,750	119,000	.006400	.000400	....	....	
30,000	120,000	.007567	.001167	.003000	.902433	
31,000	124,000	.0133	.005733	....	....	
82,000	128,000	.0233	.0100	....	....	
33,000	132,000	.0300	.0067	....	....	
34,000	136,000	.0533	.0233	....	....	
34,320	137,280	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section............pounds..	137,280
Elastic limit per square inch of original section............do...	107,000
Elongation per inch after rupture............inch..	.1333
Elongation per inch under strain at elastic limit............do...	.004067
Reduction in diameter at point of rupture............do...	.154
Reduction in area after rupture, per cent of original section............	47.2
Position of rupture............	1″.17 from the neck
Character of broken surface............	fine silky
Elongation of inch sections............	″.17*, ″.18*, ″.05

No. 4744.

Marks, 8.
Diameter, ″.564.
Sectional area, .25 square inch
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000267	.000167	....	....	
5,000	20,000	.000600	.000333	....	....	
7,500	30,000	.000933	.000333	....	....	
10,000	40,000	.001300	.000367	0.	....	
12,500	50,000	.001667	.000367	....	....	
15,000	60,000	.002000	.000333	0.	....	
17,500	70,000	.002367	.000367	....	....	
20,000	80,000	.002700	.000333	0.	....	
22,500	90,000	.003033	.000333	....	....	
25,000	100,000	.003400	.000367	0.	....	
27,500	110,000	.003767	.000367	.000033	.000033	
27,750	111,000	.003800	.000033	....	....	
28,000	112,000	.003833	.000033	....	....	
28,250	113,000	.003900	.000067	....	....	
28,500	114,000	.003967	.000067	....	....	
28,750	115,000	.004033	.000066	....	....	
29,000	116,000	.004067	.000034	....	....	
29,250	117,000	.004100	.000033	....	....	
29,500	118,000	.004133	.000033	....	....	
29,750	119,000	.004267	.000134	....	....	
30,000	120,000	.004367	.000100	.000167	.000134	
30,250	121,000	.004433	.000066	....	....	
30,500	122,000	.004500	.000067	....	....	Elastic limit.
30,750	123,000	.004600	.000100	....	....	
31,000	124,000	.004733	.000133	....	....	
31,250	125,000	.004867	.000134	....	....	
31,500	126,000	.005067	.000200	....	....	
31,750	127,000	.005233	.000166	....	....	
32,000	128,000	.005433	.000200	....	....	
32,250	129,000	.005733	.000300	....	....	
32,500	130,000	.006033	.000300	.001367	.001200	
32,750	131,000	.006300	.000267	....	....	
33,000	132,000	.006600	.000300	....	....	
33,250	133,000	.006933	.000333	....	....	
33,500	134,000	.008033	.001100	....	....	
33,750	135,000	.008733	.000700	....	....	
34,000	136,000	.009700	.000967	....	....	
34,250	137,000	.010400	.000700	....	....	
34,500	138,000	.011833	.001433	....	....	
35,000	140,000	.0167	.004867	....	....	
36,000	144,000	.0233	.0066	....	....	
36,820	147,280	.0500	.0267	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	147,280
Elastic limit per square inch of original section	do...	122,000
Elongation per inch after rupture	inch..	.0933
Elongation per inch under strain at elastic limit	do...	.004500
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		″.55 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.23*, ″.03, ″.02

Chemical composition.

	Per cent.
Total carbon	0.365
Graphitic carbon	0.074
Combined carbon	0.291
Manganese	0.547
Silicon	0.139
Sulphur	0.038
Phosphorus	0.026

No. 4664.

Marks, Feb. 15, 92.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	**Initial load.**
1,250	5,000	.000167	.000167	0.	....	
2,500	10,000	.000367	.000200	....	....	
5,000	20,000	.000700	.000333	....	....	
7,500	30,000	.001033	.000333	0.	....	
8,750	35,000	.001233	.000200	....	....	
10,000	40,000	.001400	.000167	0.	....	
10,250	41,000	.001433	.000033	....	....	
10,500	42,000	.001500	.000067	....	....	**Elastic limit.**
10,750	43,000	.028333	.026833	....	....	
11,000	44,000	.030667	.002334	....	....	
11,250	45,000	.033333	.002666	....	....	
11,500	46,000	.037000	.003667	....	....	
11,750	47,000	.040000	.003000	....	....	
15,510	62,040	....	....	....	....	**Tensile strength.**

General summary.

Tensile strength per square inch of original section	**pounds**	**62,040**
Elastic limit per square inch of original section	**do**	**42,000**
Elongation per inch after rupture	**inch**	**.3100**
Elongation per inch under strain at elastic limit	**do**	**.001500**
Reduction in diameter at point of rupture	**do**	**.194**
Reduction in area after rupture, per cent of original section		**57.0**
Position of rupture		**1″.8 from neck**
Character of broken surface		**fine silky**
Elongation of inch sections		**″.21, ″.51*, ″.21**

No. 4665.

Marks, Dec. 12, 91.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	....	
2,500	10,000	.000333	.000166	....	....	
5,000	20,000	.000667	.000334	....	....	
7,500	30,000	.001000	.000333	0.	....	
8,750	35,000	.001200	.000200	....	....	
10,000	40,000	.001367	.000167	0.	....	
10,250	41,000	.001400	.000033	....	....	
10,500	42,000	.001433	.000033	....	....	
10,750	43,000	.001467	.000034	....	....	Elastic limit.
11,000	44,000	.001600 .023333	.000133 .021733	....	....	
11,250	45,000	.025667	.002334	....	....	
11,500	46,000	.028167	.002500	....	....	
11,750	47,000	.030333	.002166	....	....	
12,000	48,000	.033667	.003334	....	....	
16,320	65,280	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	65,280
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	.3067
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per cent of original section		57.0
Position of rupture		1″.6 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.17, ″.50*, ″.25

RIFLE BARREL STEEL FROM SPRINGFIELD ARMORY.

FOR BARRELS, .30 AND .45 CALIBER.

TABULATION OF TENSION SPECIMENS.

No. of test.	Marks.	Diameter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation in 3 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Inch.	*Sq. in.*	*Pounds.*	*Pounds.*	*Inch.*	*Per ct.*	*Inch. Sq. in.*	*Per ct.*		" " "
4588	●	.564	.25	54,000	106,760	.50	16.7	Diam., .48 = .181	27.6	Granular, radiating from a dull spot at circumference.	.11, .21*, .18
4589	● ●	.564	.25	57,000	113,880	.44	14.7	Diam., .44 = .189	24.6	......do......	
4590	● ● ●	.564	.25	57,000	100,200	.52	17.3	Diam., .47 = .174	30.6	Silky, in part interspersed with fine granulation	.10, .22*, .20*
4501	● ● ● ●	.564	.25	51,000	78,320	.78	26.0	Diam., .41 = .132	47.2	Fine silky	.17, .37*, .24
4623	A	.564	.25	56,000	71,440	.78	26.0	Diam., .42 = .139	44.6	Silky	.20, .40*, .16
4624	R I	.564	.25	72,000	113,280	.45	15.0	Diam., .46 = .166	33.5	Silky, cup shaped	.08, .18*, .19*
4625	R I_2	.564	.25	64,000	87,360	.69	23.0	Diam., .39 = .119	52.2	Fine silky, cup shaped	.14, .41*, .14
4675	A I_1	.564	.25	45,000	85,120	.78	26.0	Diam., .42 = .139	44.6	Silky	.20, .40*, .18
4676	A I_2	.564	.25	45,000	84,000	.73	24.3	Diam., .43 = .145	41.9	......do......	.16, .39*, .18
4723	2	.564	.25	52,000	77,240	.88	29.3	Diam., .37 = .108	57.0	Fine silky	.18, .50*, .20
4724	2	.565	.25	55,000	77,680	.85	28.3	Diam., .38 = .113	54.6	......do......	.18, .48* .19
4725	4	.564	.25	59,000	87,800	.62	20.7	Diam., .36 = .102	59.3	......do......	.39*, .12, .11
4726	4	.564	.25	59,000	86,000	.65	21.7	Diam., .36 = .102	59.3	......do......	.37*, .14, .14
4727	6	.564	.25	79,000	111,640	.47	15.7	Diam., .39 = .119	52.2	......do......	.05, .09, .33*
4728	6	.564	.25	79,000	113,200	.40	13.3	Diam., .40 = .126	49.7	......do......	.03, .06, .31*
4741	7	.564	.25	86,000	112,160	.45	15.0	Diam., .38 = .113	54.6	......do......	.34*, .06, .05
4742	7	.564	.25	85,000	114,960	.55	18.3	Diam., .37 = .108	57.0	......do......	.35*, .12, .08
4743	8	.564	.25	107,000	137,280	.40	13.3	Diam., .41 = .132	47.2	......do......	.17*, .18*, .05
4744	8	.564	.25	122,000	147,280	.28	9.3	Diam., .44 = .152	39.2	......do......	.23*, .03, .02
4664	Feb. 15, 1892	.564	.25	42,000	62,040	.93	31.0	Diam., .37 = .108	57.0	......do......	.21, .51*, .21
4665	Dec. 12, 1891	.564	.25	43,000	65,280	.92	30.7	Diam., .37 = .108	57.0	......do......	.17, .50*, .25

STEEL FOR PRESSURE GAUGES.

TENSION AND COMPRESSION TESTS.

SPECIMENS TURNED DOWN FROM A BAR 1⅞ INCHES DIAMETER, MARKED "SANDERSON BROS. & CO. DOUBLE EXTRA STEEL 6".

No. 4690.

Mark, S.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	....	
2,500	10,000	.000350	.000250	....	....	
5,000	20,000	.000650	.000300	....	....	
7,500	30,000	.001000	.000350	....	....	
8,750	35,000	.001150	.000150	....	....	
10,000	40,000	.001300	.000150	0.	....	
11,250	45,000	.001500	.000200	....	....	
12,500	50,000	.001600	.000100	....	....	
12,750	51,000	.001650	.000050	....	....	
13,000	52,000	.001700	.000050	....	....	Elastic limit; load fell.
12,000	48,000	.009500	.007800	....	....	
12,250	49,000	.010550	.001050	....	....	
12,500	50,000	.011500	.000950	....	....	
12,750	51,000	.011900	.000400	....	....	
13,000	52,000	.012450	.000550	....	....	
13,250	53,000	.012700	.000250	....	....	
13,500	54,000	.012900	.000200	....	....	
13,750	55,000	.013150	.000250	....	....	
14,000	56,000	.013600	.000450	....	....	
14,250	57,000	.014000	.000400	....	....	
14,500	58,000	.014650	.000650	....	....	
14,750	59,000	.015150	.000500	....	....	
15,000	60,000	.015950	.000800	....	....	
15,500	62,000	.017400	.001450	....	....	
16,000	64,000	.018500	.001100	....	....	
16,500	66,000	.020150	.001650	....	....	
17,000	68,000	.021550	.001400	....	....	
17,500	70,000	.023950	.002400	....	....	
18,000	72,000	.025500	.001550	....	....	
18,500	74,000	.028100	.002600	....	....	
19,000	76,000	.031000	.002900	....	....	
19,500	78,000	.033500	.002500	....	....	
20,000	80,000	.037000	.003500	....	....	
23,360	93,440	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	93,440
Elastic limit per square inch of original section	do	52,000
Elongation per inch after rupture	inch	.1550
Elongation per inch under strain at elastic limit	do	.001700
Reduction in diameter at point of rupture	do	.054
Reduction in area after rupture, per cent of original section	do	18.3
Position of rupture		1″.15 from neck
Character of broken surface		fine granular
Elongation of inch sections		″.16*, ″.15*

Chemical composition.

	Per cent.
Total carbon	1.145
Graphitic carbon	0.063
Combined carbon	1.082
Manganese	0.129
Silicon	0.230
Sulphur	0.006
Phosphorus	0.006

No. 1057.

Marks, S.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
5,000	10,000	.000300	.000300	0.	....	
10,000	20,000	.000667	.000367	....	....	
15,000	30,000	.000967	.000300	....	....	
20,000	40,000	.001267	.000300	0.	....	
22,500	45,000	.001400	.000133	....	....	
24,000	48,000	.001500	.000100	....	....	Elastic limit.
24,500	49,000	.002633	.001133	....	....	
25,000	50,000	.011167	.008534	....	....	
25,500	51,000	.011267	.000100	....	....	
26,000	52,000	.011467	.000200	....	....	
26,500	53,000	.011633	.000166	....	....	
27,000	54,000	.012367	.000734	....	....	
27,500	55.000	.012600	.000233	....	....	
28,000	56,000	.012867	.000267	....	....	
28,500	57,000	.013233	.000366	....	....	
29,000	58,000	.013867	.000634	....	....	
29,500	59,000	.014300	.000433	....	....	
30,000	60,000	.014700	.000400	....	....	
31,000	62,000	.015700	.001000	....	....	
32,000	64,000	.016700	.001000	....	....	
33,000	66,000	.017933	.001233	....	....	
34,000	68,000	.019033	.001100	....	....	
35,000	70,000	.020333	.001300	....	....	
49,100	98,200	....	....	....	....	Ultimate strength.

Failed by double flexure.

No. 1058.

Mark, S.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
5,000	10,000	.000300	.000300	0.	....	
10,000	20,000	.000667	.000367	....	....	
15,000	30,000	.001000	.000333	....	....	
20,000	40,000	.001333	.000333	0.	....	
22,500	45,000	.001467	.000134	....	....	
24,000	48,000	.001567	.000100	....	....	Elastic limit.
24,500	49,000	.001700	.000133	....	....	
		.008667	.006967	....	....	
25,000	50,000	.010500	.001833	....	....	
25,500	51,000	.010800	.000300	....	....	
26,000	52,000	.011000	.000200	....	....	
26,500	53,000	.011833	.000333	....	....	
27,000	54,000	.011800	.000467	....	....	
27,500	55,000	.012167	.000367	....	....	
28,000	56,000	.012500	.000333	....	....	
28,500	57,000	.012967	.000467	....	....	
29,000	58,000	.013467	.000500	....	....	
29,500	59,000	.014000	.000533	....	....	
30,000	60,000	.014400	.000400	....	....	
31,000	62,000	.015233	.000833	....	....	
32,000	64,000	.016367	.001134	....	....	
33,000	66,000	.017467	.001100	....	....	
34,000	68,000	.018467	.001000	....	....	
35,000	70,000	.019800	.001333	....	....	
53,400	106,800	....	....	....	....	Ultimate strength.

Failed by triple flexure.

SPECIMENS TURNED DOWN FROM A BAR 2 INCHES DIAMETER, MARKED "(R A) HOBSON WARRANTED CAST STEEL (CHOICE) (XX) EXTRA".

No. 4691.

Mark, H.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000350	.000250			
5,000	20,000	.000650	.000300			
7.500	30,000	.001050	.000400			
8,750	35,000	.001150	.000100			
10,000	40,000	.001400	.000250	0.		
11,250	45,000	.001550	.000150			
12,500	50,000	.001650	.000100	0.		
13,750	55,000	.001900	.000250			
15,000	60,000	.002050	.000150	0.		
16,250	65,000	.002200	.000150			
17,500	70,000	.002450	.000250	.000050	.000050	
17,750	71,000	.002500	.000050			Elastic limit; load fell.
16,000	64,000	.006050	.003550			
16,250	65,000	.006800	.000750			
16,500	66,000	.009500	.002700			
16,750	67,000	.011900	.002400			
17,000	68,000	.012350	.000450			
17,250	69,000	.012450	.000100			
17,500	70,000	.012600	.000150			
17,750	71,000	.012950	.000350			
18,000	72,000	.013250	.000300			
18,250	73,000	.013600	.000350			
18,500	74,000	.014050	.000450			
18,750	75,000	.014500	.000450			
19,000	76,000	.014850	.000350			
19,250	77,000	.015200	.000350			
19,500	78,000	.015700	.000500			
19,750	79,000	.016050	.000350			
20,000	80,000	.016600	.000550	.012150	.012100	
27,930	111,720					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	111,720
Elastic limit per square inch of original section	do	71,000
Elongation per inch after rupture	inch	.0550
Elongation per inch under strain at elastic limit	do	.002500
Reduction in diameter at point of rupture	do	.024
Reduction in area after rupture, per cent of original section		8.4
Position of rupture		1".06 from neck
Character of broken surface		Fine granular
Elongation of inch sections		".06*, ".05*

Chemical composition.

	Per cent.
Total carbon	1.200
Graphitic carbon	0.054
Combined carbon	1.146
Manganese	0.103
Silicon	0.105
Sulphur	0.010
Phosphorus	0.025

No. 1059.

Mark, H.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
5,000	10,000	.000333	.000333	0.		
10,000	20,000	.000767	.000434			
15,000	30,000	.001100	.000333			
20,000	40,000	.001433	.000333	0.		
22,500	45,000	.001600	.000167			
25,000	50,000	.001767	.000167			
27,500	55,000	.001933	.000166			
30,000	60,000	.002133	.000200	0.		
30,500	61,000	.002167	.000034			
31,000	62,000	.002200	.000033			
31,500	63,000	.002233	.000033			
32,000	64,000	.002267	.000034			Elastic limit.
32,500	65,000	.010667	.008400			
33,000	66,000	.010800	.000133			
33,500	67,000	.010933	.000133			
34,000	68,000	.011167	.000234			
34,500	69,000	.011467	.000300			
35,000	70,000	.011667	.000200			
36,000	72,000	.012467	.000800			
37,000	74,000	.013167	.000700			
38,000	76,000	.013867	.000700			
39,000	78,000	.014533	.000666			
40,000	80,000	.015267	.000734			
64,820	129,640					Ultimate strength.

Failed by triple flexure.

No. 1060.

Mark, H.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
5,000	10,000	.000367	.000367	0.	....	
10,000	20,000	.000800	.000433	....	....	
15,000	30,000	.001133	.000333	....	....	
20,000	40,000	.001433	.000300	0.	....	
22,500	45,000	.001600	.000167	....	....	
25,000	50,000	.001733	.000133	....	....	
27,500	55,000	.001867	.000134	....	....	
30,000	60,000	.002000	.000133	0.	....	
30,500	61,000	.002033	.000033	....	....	
31,000	62,000	.002067	.000034	....	....	
31,500	63,000	.002100	.000033	....	....	
32,000	64,000	.002100	0.	....	....	Elastic limit.
32,500	65,000	.005500	.003400	....	....	
33,000	66,000	.006667	.001167	....	....	
33,500	67,000	.011167	.004500	....	....	
34,000	68,000	.011300	.000133	....	....	
34,500	69,000	.011467	.000167	....	....	
35,000	70,000	.011667	.000200	....	....	
36,000	72,000	.012200	.000533	....	....	
37,000	74,000	.012867	.000667	....	....	
38,000	76,000	.013633	.000766	....	....	
39,000	78,000	.014300	.000667	....	....	
40,000	80,000	.015167	.000867	....	....	
67,360	134,720	....	....	....	....	Ultimate strength.

Failed by triple flexure.

SPECIMENS TURNED DOWN FROM A BAR 2 INCHES + DIAMETER, FROM THE MIDVALE STEEL COMPANY.

No. 4692.

Mark, M.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	...	...	
2,500	10,000	.000350	.000250	0.	...	
5,000	20,060	.000600	.000250	...	...	
7,500	30,000	.001000	.000400	...	...	
10,000	40,000	.001400	.000400	...	...	
11,250	45,000	.001550	.000150	0.	...	
12,500	50,000	.001750	.000200	...	...	
13,750	55,000	.001950	.000200	...	...	
15,000	60,000	.002100	.000150	.000050	.000050	
16,250	65,000	.002300	.000200	...	...	
17,500	70,000	.002500	.000200	.000050	0.	
17,750	71,000	.002550	.000050	...	...	
18,000	72,000	.002600	.000050	...	...	Elastic limit; Load fell.
17,000	68,000	.007500	.004900	...	...	
17,250	69,000	.008450	.000950	...	...	
17,500	70,000	.009400	.000950	...	...	
17,750	71,000	.009550	.000150	...	...	
18,000	72,000	.009950	.000400	...	...	
18,250	73,000	.010150	.000200	...	...	
18,500	74,000	.010550	.000400	...	...	
18,750	75,000	.010950	.000400	...	...	
19,000	76,000	.011450	.000500	...	...	
19,250	77,000	.011700	.000250	...	...	
19,500	78,000	.012250	.000550	...	...	
19,750	79,000	.012600	.000350	...	...	
20,000	80,000	.013150	.000550	.009350	.009300	
32,620	130,480	...	...	...	...	Tensile strength.

General summary.

Tensile strength per square inch of original section ....pounds..	130,480
Elastic limit per square inch of original section ....do..	72,000
Elongation per inch after rupture....inch..	.0550
Elongation per inch under strain at elastic limit....do..	.002600
Reduction in diameter at point of rupture....do..	.024
Reduction in area after rupture, per cent of original section	8.4
Position of rupture....	at neck
Character of broken surface....	fine granular
Elongation of inch sections	″.06″, ″.05

Chemical composition.

	Per cent.
Total carbon....	0.936
Graphitic carbon....	0.009
Combined carbon....	0.927
Manganese	0.488
Silicon....	0.258
Sulphur	0.008
Phosphorus	0.006

No. 1061.

Mark, M.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	**Initial load.**
5,000	10,000	.000367	.000367	0.	....	
10,000	20,000	.000767	.000400	....	....	
15,000	30,000	.001033	.000266	....	....	
20,000	40,000	.001367	.000334	.000033	.000033	
22,500	45,000	.001533	.000166	....	....	
25,000	50,000	.001667	.000134	.000033	0.	
27,500	55,000	.001867	.000200	....	....	
30,000	60,000	.002000	.000133	.000033	0.	
32,500	65,000	.002167	.000167	....	....	
33,000	66,000	.002200	.000033	....	....	**Elastic limit.**
33,500	67,000	.002833	.000633	....	....	
34,000	68,000	.003233	.000400	....	....	
34,500	69,000	.006667	.003434	....	....	
35,000	70,000	.009000	.002333	....	....	
36,000	72,000	.009500	.000500	....	....	
37,000	74,000	.010067	.000567	....	....	
38,000	76,000	.010867	.000800	....	....	
39,000	78,000	.011667	.000800	....	....	
71,040	142,080	.012600	.000933	....	....	**Ultimate strength.**

Failed by triple flexure.

No. 1062.

Mark, M.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	**Initial load.**
5,000	10,000	.000367	.000367	0.	....	
10,000	20,000	.000733	.000366	....	....	
15,000	30,000	.001067	.000334	....	....	
20,000	40,000	.001400	.000333	0.	....	
22,500	45,000	.001533	.000133	....	....	
25,000	56,000	.001700	.000167	....	....	
27,500	55,000	.001867	.000167	....	....	
30,000	60,000	.002033	.000166	.000033	.000033	
32,500	65,000	.002167	.000134	....	....	**Elastic limit.**
33,000	66,000	.002333	.000166	....	....	
33,500	67,000	.002667	.000334	....	....	
34,000	68,000	.003133	.000466	....	....	
34,500	69,000	.004167	.001034	....	....	
35,000	70,000	.010233	.006066	....	....	
36,000	72,000	.010467	.000234	....	....	
37,000	74,000	.010933	.000466	....	....	
38,000	76,000	.011500	.000567	....	....	
39,000	78,000	.012500	.001000	....	....	
40,000	80,000	.013167	.000667	....	....	
69,620	139,240	....	....	....	....	**Ultimate strength.**

Failed by triple flexure.

INITIAL STRAINS

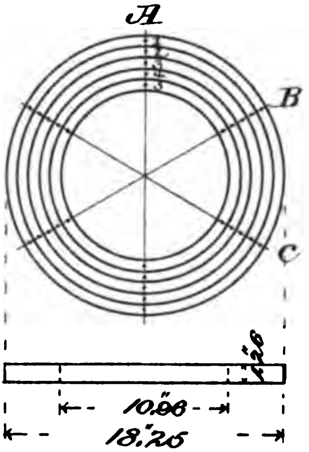
IN

12-INCH TUBE AND JACKET AND STEEL RINGS.

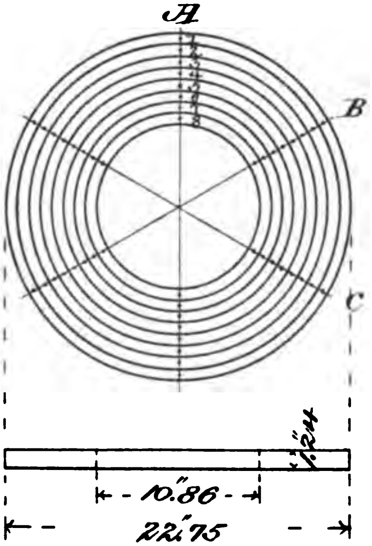
12-inch B. L. Rifle.

Tube

Muzzle end.



Breech end.



No. 5476.

12-INCH TUBE.

MUZZLE END.

Marks, $\overset{\text{12 R, T}}{\text{M T R}}$

Ring.	Diameters.				Corresponding stress per square inch	
	A.	B.	C.	Mean.	Tension.	Compression.
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Pounds.*	*Pounds.*
No. 1. In slice	17.5259	17.5219	17.4832	17.51033	....	....
No. 1. Detached	17.5269	17.5224	17.4791	17.50947	....	....
	+.0010	+.0005	—.0041	—.00086	1478	....
No. 2. In slice	16.0441	16.0171	16.0230	16.02807	....	....
No. 2. Detached	16.0450	16.0167	16.0228	16.02817	....	....
	+.0009	—.0004	—.0002	+.00010	....	187
No. 3. In slice	14.5550	14.5483	14.5575	14.55360	....	....
No. 3. Detached	14.5559	14.5462	14.5573	14.55313	....	....
	+.0009	—.0021	—.0002	—.00047	969	....
No. 4. In slice	13.0525	13.0479	13.0285	13.04297	....	....
No. 4. Detached	13.0530	13.0474	13.0270	13.04247	....	....
	+.0005	—.0005	—.0015	—.00050	1150	....
No. 5. In slice	11.6313	11.6481	11.6358	11.6384	....	....
No. 5. Detached	11.6323	11.6494	11.6359	11.6392	....	....
	+.0010	+.0013	+.0001	+.0008	....	2062

No. 5475.

12-INCH TUBE.

BREECH END.

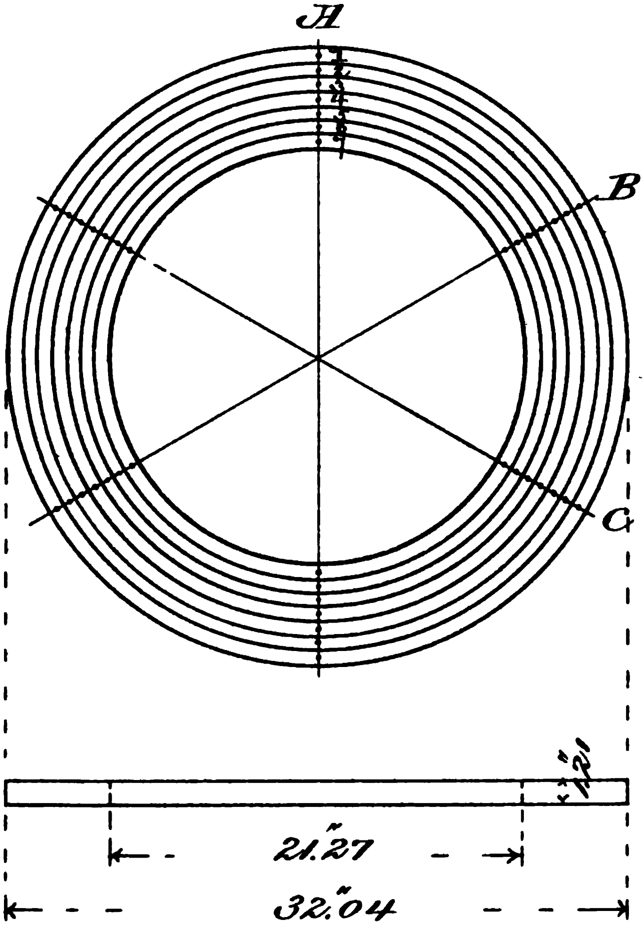
Marks, $\frac{12\ R,\ T}{B\ T\ E}$

Ring.	Diameters.				Corresponding stress per square inch.	
	A.	B.	C.	Mean.	Tension.	Compression,
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Pounds.*	*Pounds.*
No. 1. In slice	22.0973	22.1083	22.0890	22.09820	....	....
No. 1. Detached	22.0968	22.1106	22.0847	22.09737	....	....
	—.0005	+.0023	—.0043	.00083	1126	....
No. 2. In slice	20.5519	20.5660	20.5559	20.55793	....	....
No. 2. Detached	20.5514	20.5665	20.5565	20.55813	....	....
	—.0005	+.0005	+.0006	+.00020	....	291
No. 3. In slice	19.0322	19.0562	19.0423	19.04356	....	....
No. 3. Detached	19.0320	19.0563	19.0396	19.04263	....	....
	—.0002	+.0001	—.0027	—.00093	1465	....
No. 4. In slice	17.4969	17.5030	17.4963	17.49873	....	....
No. 4. Detached	17.4963	17.5024	17.4957	17.49813	....	....
	—.0006	—.0006	—.0006	—.00060	1028	....
No. 5. In slice	15.9738	15.9557	15.9590	15.96283	....	....
No. 5. Detached	15.9730	15.9554	15.9590	15.96247	....	....
	—.0008	—.0003	.0000	—.00036	676	....
No. 6. In slice	14.4879	14.4673	14.4858	14.48033	....	....
No. 6. Detached	14.4906	14.4705	14.4885	14.48320	....	....
	+.0027	+.0032	+.0027	+.00287	....	5946
No. 7. In slice	12.9879	12.9495	12.9749	12.97077	....	....
No. 7. Detached	12.9870	12.9489	12.9765	12.97080	....	....
	—.0009	—.0006	+.0016	+.00003	....	69
No. 8. In slice	11.4715	11.4811	11.4721	11.47490	....	....
No. 8. Detached	11.4715	11.4814	11.4723	11.47507	....	....
	.0000	+.0003	+.0002	+.00017	....	444

12-inch B.L. Rifle.

Jacket

Muzzle end.



No. 5474.

12-INCH JACKET.

MUZZLE END.

Marks, $^{12\ R,\ J}_{M\ T\ R}$

Ring.	Diameters.				Corresponding stress per square inch.	
	A.	B.	C.	Mean.	Tension	Compression.
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Pounds.*	*Pounds.*
No. 1. In slice	31.2176	31.2485	31.2877	31.25127	....	....
No. 1. Detached	32.2157	31.2448	31.2952	31.25190	....	....
	−.0019	−.0037	+.0075	+.00063	....	605
No. 2. In slice	29.6610	29.6772	29.6582	29.66547	....	....
No. 2. Detached	29.6607	29.6776	29.6599	29.66607	....	....
	−.0003	+.0004	+.0017	+.00060	....	606
No. 3. In slice	28.1063	28.1168	28.1118	28.11163	....	....
No. 3. Detached	28.1136	28.1141	28.1009	28.10953	....	....
	+.0073	−.0027	−.0109	−.00210	2241	
No. 4. In slice	26.5510	26.5608	26.5458	26.55253	....	....
No. 4. Detached	26.5442	26.5632	26.5500	26.55246	....	....
	−.0068	+.0024	+.0042	−.00007	79	....
No. 5. In slice	25.0334	25.0371	25.0601	25.04020	....	....
No. 5. Detached	25.0349	25.0323	25.0511	25.03943	....	....
	+.0015	−.0048	+.0010	−.00077	922	....
No. 6. In slice	23.5248	23.4963	23.5102	23.51043	....	....
No. 6. Detached	23.5295	23.4991	23.5064	23.51167	....	....
	+.0047	+.0028	−.0038	+.00124	....	1582
No. 7. In slice	21.9737	21.9628	21.9661	21.96753	....	....
No. 7. Detached	21.9716	21.4651	21.9676	21.96810	....	....
	−.0021	+.0028	+.0015	+.00057	....	778

No. 5473.

12-INCH JACKET.

BREECH END.

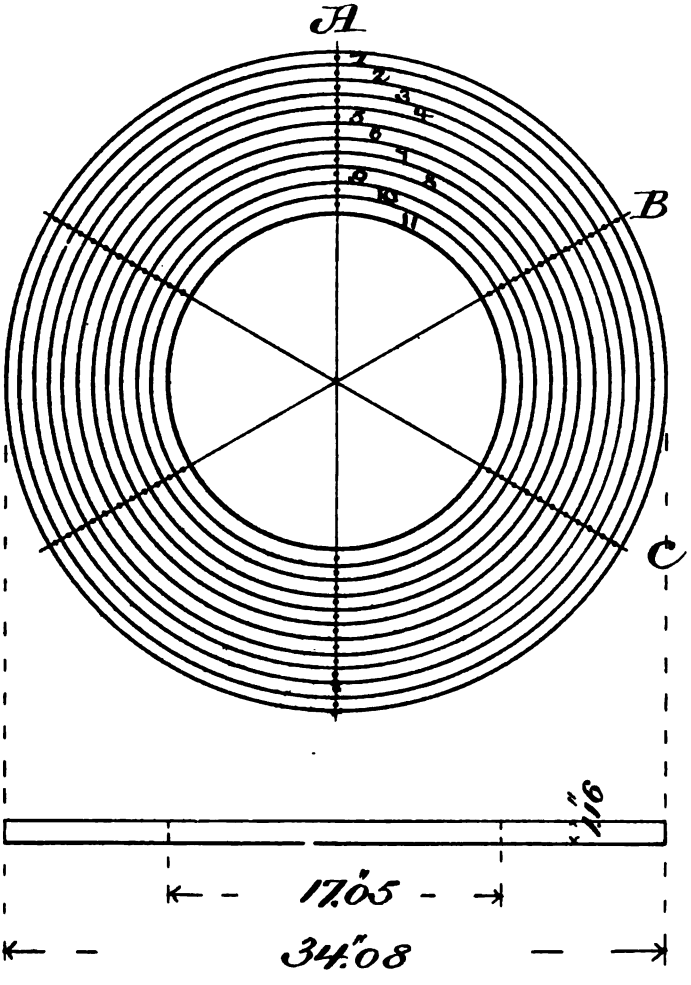
Marks, $\overset{12\,\text{R. J}}{\text{B T R}}$

Ring.	Diameters.				Corresponding stress per square inch.	
	A.	B.	C.	Mean.	Tension.	Compression.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Pounds*	*Pounds.*
No. 1. In slice	33.4203	33.4240	33.4258	33.42337	....	....
No. 1. Detached	33.4213	33.4230	33.4230	33.42253	....	....
	+.0010	—.0007	—.0028	—.00084	753	....
No. 2. In slice	31.8921	31.8648	31.8670	31.87463	....	....
No. 2. Detached	31.8945	31.8667	31.8620	31.87440	....	....
	+.0024	—.0019	—.0050	—.00023	216	....
No. 3. In slice	30.3971	30.3637	30.3645	30.37510	....	....
No. 3. Detached	30.3972	30.3641	30.3629	30.37473	....	....
	+.0001	+.0004	—.0016	—.00037	365	....
No. 4. In slice	28.8524	28.8350	28.8391	28.84217	....	....
No. 4. Detached	28.8489	28.8354	28.8394	28.84123	....	....
	—.0035	+.0004	+.0003	—.00094	977	....
No. 5. In slice	27.3105	27.2933	27.2966	27.30013	....	....
No. 5. Detached	27.3079	27.2938	27.2961	27.29927	....	....
	—.0026	+.0005	—.0005	—.00086	945	....
No. 6. In slice	25.8320	25.8205	25.7932	25.81523	....	....
No. 6. Detached	25.8306	25.8197	25.7930	25.81443	....	....
	—.0014	—.0008	—.0002	—.00080	929	....
No. 7. In slice	24.2037	24.2040	24.2034	24.20370	....	....
No. 7. Detached	24.2038	24.2060	24.2008	24.20353	....	....
	+.0001	+.0020	—.0026	—.00017	210	....
No. 8. In slice	22.6263	22.6134	22.5634	22.60103	....	....
No. 8. Detached	22.6267	22.6140	22.5620	22.60090	....	....
	+.0004	+.0006	—.0014	—.00013	172	....
No. 9. In slice	21.0830	21.0660	21.0704	21.07313	....	....
No. 9. Detached	21.0834	21.0623	21.0751	21.07360	....	....
	+.0004	—.0037	+.0047	+.00047	....	669
No. 10. In slice	19.5296	19.5296	19.5180	19.52573	....	....
No. 10. Detached	19.5320	19.5260	19.5239	19.52730	....	....
	+.0024	—.0036	+.0059	+.00157	....	2412
No. 11. In slice	17.9750	18.0063	17.9575	17.9796	....	....
No. 11. Detached	17.9774	18.0009	17.9602	17.9795	....	....
	+.0024	—.0054	+.0027	—.0001	167	

12-inch B. L. Rifle.

Jacket

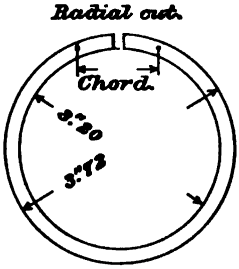
Breech end.



INITIAL STRAINS.

TESTS TO DETERMINE THE EFFECTS OF TURNING OFF HEAVY CHIPS ON THE INTRODUCTION OF INITIAL STRAINS IN STEEL RINGS.

No. 5454.



Length of ring, ″.85.

A chord about 1″.300 was measured and then the ring cut a part radially midway the extremities of the measured chord.

The cut allowed the chord to shorten ″.0002; hence very slight strains were released.

Next, putting the ring on a face plate of a lathe and clamping it in position by means of a central disk and bolt, the outside diameter of the ring was turned down with one heavy cut and coarse feed, from 3″.72 diameter to 3″.54—″.09 thickness of metal on a side being turned off.

Again measuring the chord, it was found ″.0010 longer than originally laid off.

No. 5455.

Length of ring, ″.85.

Exterior diameter, 3″.71.

Interior diameter, 3″.20.

A chord about 1″.3 long laid off same as in test 5454.

Measured chord before and after cutting apart radially midway the chord; the effect of cutting was to lengthen the chord measurement ″.0009.

No. 5456.

Length of ring, ″.85.

Exterior diameter, 3″.70.

Interior diameter, 3″.20.

Ring was cut apart radially and chord measured across the cut; a chip was then turned off, reducing the exterior diameter to 3″.53.

The chord was again measured and it was found that turning off the outside chip caused the chord measurement to enlarge ″.0024.

No. 5457.

Length of ring, ″.85.

Exterior diameter, 3″.70.

Interior diameter, 3″.20.

Ring carefully annealed and cut apart radially.

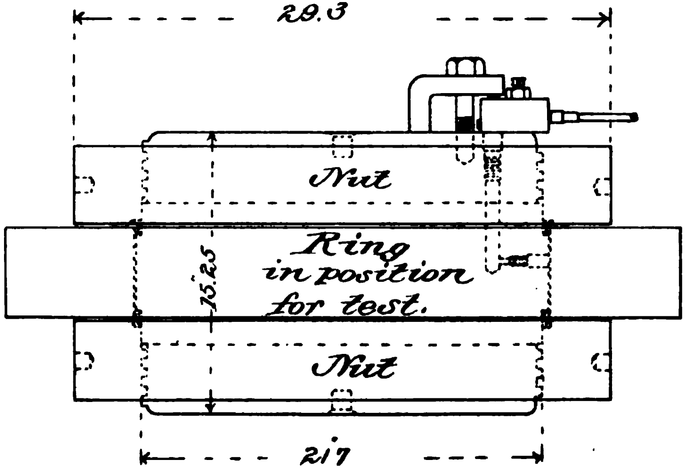
Chord measured across the cut, and ring turned out on inside with one chip to 3″.34 diameter.

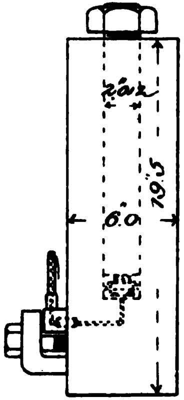
Effect of taking off chip from inside was to diminish the chord measurement ″.058.

10-INCH WIRE WRAPPED WOODBRIDGE B. L. RIFLE.

HYDROSTATIC TEST OF INNER STAVE RING.

Apparatus for applying hydrostatic pressure to Inner stave ring, 10-inch W. W. Woodbridge gun.





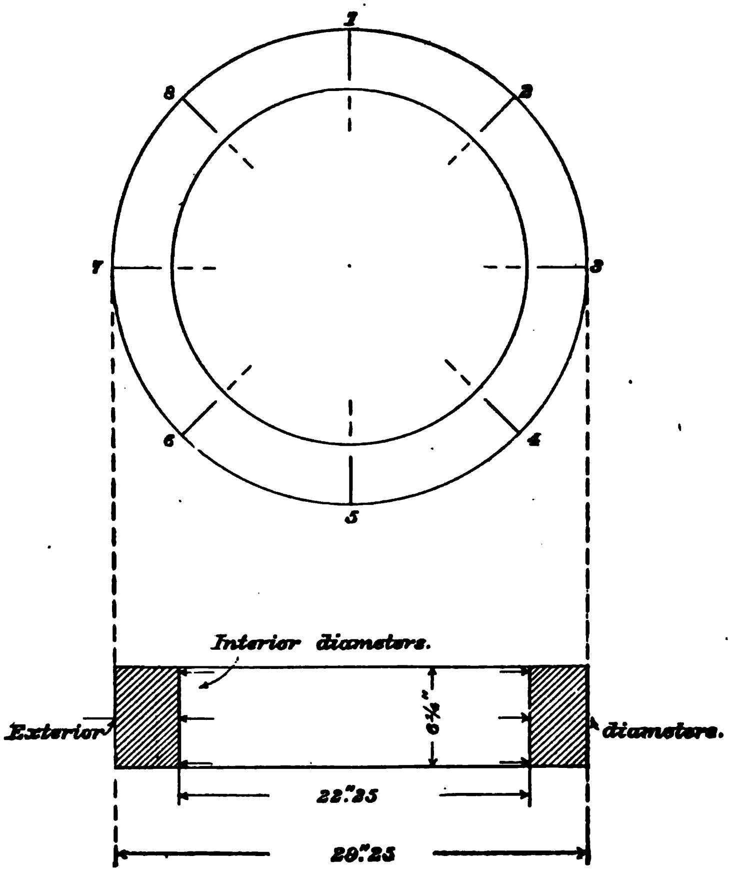
Reservoir

10-INCH WIRE WRAPPED WOODBRIDGE B. L. RIFLE.

INNER STAVE RING.

[Experiments made under the direction and with apparatus designed by Dr. W. E. Woodbridge.]

The ring was subjected to interior hydrostatic pressure by means of the apparatus herewith illustrated, and measurements showing expansion of diameters taken while the ring was under pressure, and permanent sets observed after the release of loads.



The measurements included surface diameters over the exterior of the ring, diameters at the middle of the thickness, and those near the interior surface; the latter being taken about ".10 from the surface of the bore.

The diameters at the middle of the thickness, and near the surface of the bore, were taken by means of pins inserted into small drilled holes in the ring which penetrated to the required depth. The inner ends of the pins rested against the metal of the ring at the bottom of the holes, while the outer ends projected beyond the exterior diameter, and were thus accessible to the calipers.

Exterior diameters were also measured with pins having collars which rested against the ring around the small drilled holes.

The interior pressures per square inch were assumed to be the total load applied by the testing machine to the piston of the reservoir divided by the area of the piston.

The tables show the amount of expansion measured on each diameter under the indicated pressures and the amount of permanent sets when the pressures were released.

The original diameters of the ring to which the recorded expansions refer were as follows:

	"
Exterior surface	29.52
Near middle of thickness of ring	25.75
Near interior surface of ring	22.45

It will be observed that the total expansion under what was apparently 15,000 pounds per square inch was less than the recorded expansion under 14,000 pounds per square inch. The condition of the straining apparatus was such as to possibly explain the anomalous action of the ring.

Difficulty had been experienced with the hydraulic packings; excessive leakage occurred. In order to check the rapid leakage at the packings, ground ginger root and wood pulp had been introduced to the reservoir with the water used in charging the apparatus, and it is believed that the material thus introduced occasioned a partial or complete sealing of the pressure before it reached the ring, and the maximum pressure of the reservoir failed at the time to reach the interior surface of the ring.

TABLE SHOWING EXPANSION OF INNER STAVE RING UNDER PRESSURE AND PERMANENT SETS.

Interior pressure per square inch.	Expansion of ring.															
	Diameters 1-5.				Diameters 2-6.				Diameters 3-7.				Diameters 4-8.			
	Exterior surface with pins.		Near interior surface of ring.		Exterior surface with pins.		Near middle of thickness of ring.		Exterior surface with pins.		Near interior surface of ring.		Exterior surface with pins.		Near middle of thickness of ring.	
	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3,000	.0075	.0075	.0086	.0086	.0081	.0081	.0086	.0086	.0083	.0083	.0095	.0095	.0077	.0077	.0083	.0083
4,000	.0105	.0030	.0113	.0027	.0114	.0033	.0113	.0027	.0114	.0031	.0123	.0028	.0110	.0033	.0112	.0029
5,000	.0133	.0028	.0153	.0040	.0142	.0028	.0146	.0033	.0145	.0031	.0160	.0037	.0138	.0028	.0145	.0033
6,000	.0160	.0027	.0181	.0028	.0171	.0029	.0177	.0031	.0173	.0028	.0191	.0031	.0170	.0032	.0174	.0029
7,000	.0189	.0029	.0212	.0031	.0200	.0029	.0202	.0025	.0200	.0027	.0221	.0030	.0198	.0028	.0206	.0032
8,000	This pressure applied four times, rapid leakage preventing micrometer readings being taken at the time.															
0	.0002	.0002	.0005	.0005	.0008	.0008	.0007	.0007	.0007	.0007	.0010	.0010	.0002	.0002	.0005	.0005
12,000	.0324	.0135	.0370	.0158	.0346	.0146	.0364	.0162	.0408	.0208	.0445	.0224	.0384	.0186	.0405	.0199
0	.0016	.0014	.0037	.0032	.0027	.0019	.0035	.0028	.0063	.0056	.0081	.0071	.0057	.0055	.0066	.0061
13,000	.0389	.0065	.0482	.0112	.0496	.0150	.0466	.0102	.0606	.0198	.0609	.0164	.0529	.0145	.0549	.0144
0	.0074	.0058	.0122	.0085	....	....	....	....	....	....	....	....	....	....	....	....
14,000	....	....	.0819	.0337	....	....	.0871	.0405	....	....	.1110	.0501	....	....	....	....
0	.0331	.0257	.0447	.0325	.0458	.0431	.0497	.0462	.0591	.0528	.0670	.0589	.0478	.0421	.0507	.0441

RING REMOVED FROM STRAINING APPARATUS.

0	.0291	—.0040	.0404	—.0043	.0458	0.	.0498	.0001	.0610	.0019	.0684	.0014	.0460	—.0018	.0500	—.0007

PERMANENT EXPANSION OF INTERIOR OF RING.

[The diameters correspond to those which had been taken at the extérior of the same numbers.]

Interior pressure per square inch.	Diameters 1-5.			Diameters 2-6.			Diameters 3-7.			Diameters 4-8.		
	Top end of ring.	Middle of length.	Bottom end of ring.	Top end of ring.	Middle of length.	Bottom end of ring.	Top end of ring.	Middle of length.	Bottom end of ring.	Top end of ring.	Middle of length.	Bottom end of ring.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
0	.0066	.0404	.0775	.0210	.0542	.0936	.0336	.0675	.1060	.0211	.0554	.0032

RING RETURNED TO THE STRAINING APPARATUS.

Interior pressure per square inch.	Expansion of ring.															
	Diameters, 1-5.				Diameters, 2-6.				Diameters, 3-7.				Diameters, 4-8.			
	Exterior surface with pins.		Near interior surface of ring.		Exterior surface of ring.		Near middle of thickness of ring.		Exterior surface with pins.		Near interior surface of ring.		Exterior surface with pins.		Near middle of thickness of ring.	
	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
14,000	.0674	.0383	.0667	.0463	.0840	.0382	.0935	.0437	.0971	.0361	.1133	.0449	.0803	.0343	.0888	.0388
15,000	.0623	—.0051	.0749	—.0118	.0800	—.0040	.0825	—.0110	.0938	—.0033	.1020	—.0113	.0764	—.0039	.0788	—.0100
16,000	Maximum pressure momentarily reached, then sudden drop, followed by escape of spray from end of ring.															
0.	.0460	.0169	.0594	.0190	.0673	.0215	.0731	.0233	.0800	.0190	.0912	.0228	.0635	.0175	.0681	.0181

Ring removed from straining apparatus.

TOTAL EXPANSION OF INTERIOR OF RING.

Interior pressure per square inch.	Diameters, 1-5.			Diameters, 2-6.			Diameters, 3-7.			Diameters, 4-8.		
	Top end of ring.	Middle of length.	Bottom end of ring.	Top end of ring.	Middle of length.	Bottom end of ring.	Top end of ring.	Middle of length.	Bottom end of ring.	Top end of ring.	Middle of length.	Bottom end of ring.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
0	.0086	.0587	.1123	.0295	.0780	.1350	.0412	.0903	.1464	.0238	.0727	.1277

PERMANENT EXPANSION OF EXTERIOR SURFACE OF RING AFTER BEING STRAINED BY PRESSURES RECORDED IN TABLE.

[Measurements taken after loads were released.]

After interior pressure per square inch of—	Permanent sets.			
	Diameters.			
	1–5.	2–6.	3–7.	4–8.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
8,000	.0007	.0010	.0014	.0010
12,000	.0022	.0028	.0067	.0061
14,000	.0333	.0467	.0593	.0485
	Ring removed from straining fixture.			
	.0296	.0460	.0613	.0473
	Again placed on straining fixture.			
16,000	.0471	.0679	.0810	.0653

HARDENED AND TEMPERED STEEL.

TRANSVERSE AND TENSION TESTS.

HARDENED AND TEMPERED STEEL.

These experiments were undertaken preliminary to the manufacture of Belleville springs for 12-inch B. L. rifled mortar spring return carriages, to aid in the selection of a suitable material and determining the proper treatment in tempering.

Experimental springs were made from plates $\frac{7}{16}''$ in thickness.

These tempered strips were from the same plates; they were the full thickness of the plates and were planed out in widths from about $\frac{5}{16}''$ to $\frac{7}{16}''$, according as the material permitted, after first having cut out disks for springs.

Five grades of plate steel were experimented with, and a number of experiments made with some spring steel bars in store at the arsenal.

The details of the tempering process were varied; hardening the strips, which were heated to different temperatures, by quenching in different baths at different temperatures. The temperature at which the temper was drawn was also varied.

In defining the temperatures of drawing the temper, the color full blue, refers to that shade when a deep or intense shade of blue was reached.

Raising the temperature, next imparts a shade of light blue, above which the color of the metal does not afford a reliable indication of the temperature until the steel becomes red hot.

After drawing the temper the strips were immediately cooled in oil.

In so wide a field of research as the tempering of steel, a comparatively small number of experiments can hardly do more than furnish indications of what range in physical properties might be expected.

In the present experiments certain well defined results were produced, and to these attention will be called, reserving, however, more extended remarks and discussion of results until a comprehensive series of experiments in progress are completed.

In general, it appears from these preliminary experiments that heating and quenching in baths of comparatively slow action may cause decided increase in strength over the steel in its natural state as rolled or hammered plate, and the metal may be characterized by toughness without subsequent drawing of the temper.

While the metal may in this manner have its strength increased to a certain extent, yet more energetic hardening followed by drawing the temper has produced higher results.

The maximum transverse strength attained has been in those cases where the metal was first brought to a state of full hardness.

While in the state of full hardness the metal was very brittle and apparently in a weakened condition. Upon drawing the temper the metal displayed great strength, at first accompanied by brittleness, but as the temperature of drawing was increased it regained toughness and at the same time lost in transverse strength.

This behavior suggests the explanation that although apparently weak when in a state of intense hardness, the metal may then in reality be in its strongest condition, the apparent weakness being due to internal strains assisting the external force applied in causing ruptures, moderate heating relieving the hardening strains and destroying the tendency to rupture from within the metal.

The minimum quenching temperature, sudden cooling from below which did not sensibly increase the transverse strength, appeared to vary with the different grades of steel.

Certain strips were very susceptible to hardening cracks. This was observed with the steels of 1.04 per cent and 1.25 per cent manganese. When hardening the Belleville springs this tendency to crack was more conspicuous than in the case of the small strips.

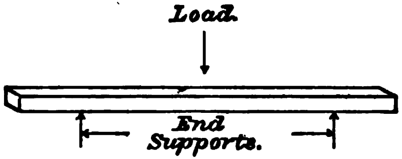
The range of temperature from which full hardness could be given the high manganese steel without cracking was very limited. Great strength was reached, accompanied, however, by brittleness.

The high silicon steel showed no unusual features attributable to its chemical composition.

The size of the piece influences the manner of treatment. Oil quenching was sufficiently energetic for the strips, whereas water quenching seemed necessary for the springs, which further emphasizes the influence of initial hardness before the temper is drawn.

TEMPERED STEEL STRIPS. BELLEVILLE SPRINGS EXPERIMENTAL METAL.

TEMPERING TREATMENT AND TRANSVERSE TESTS.



SPECIMENS FROM BESSEMER PLATE MARKED 4.

[Chemical composition: Carbon, .47; manganese, .620; silicon, .363. End supports 8″ apart.]

No. of test.	Treatment.				Dimensions.		Ultimate strength.		Fracture.
	Color heated to—	Hardened in—		Temper drawn at—	Breadth.	Depth.	Total.	Maximum fiber stress.	
		Fluid.	Temperature.						
			°F.		*Inch.*	*Inch.*	*Pounds.*	*Pounds.*	
126	Bright red	Water	200	Not drawn	.326	.447	1,240	228,920	Rapid yielding at 800 pounds. Bent 58° then fractured. Silky.
127	do	do	80	Full blue	.340	.454	1,576	270,170	Bent about 2° then fractured. Fine granular.
128	do	do	50	do	.424	.448	1,896	274,120	No appreciable permanent bend. Fine granular.
131	do	do	103	do	.346	.454	1,488	251,490	Do.
129	do	do	50	Light blue	.425	.448	2,348	329,540	Do.
145	do	Oil	50	Not drawn	.3405	.4528	1,142	196,330	Bent 57° without fracture.
130	do	do	60	do	.322	.443	1,015	193,330	Rapid yielding at 700 pounds. Bent 81° without fracture.
144	do	do	50	Deep purple	.3136	.4444	1,008	195,250	Bent 48° without fracture.
143	do	do	51	Full blue	.338	.453	1,252	216,800	Bent 65° without fracture.
142	do	do	50	Nearly light blue	.314	.450	1,140	215,430	Bent 54° then fractured. Silky 50 per cent; granular 50 per cent.

SPECIMENS FROM BESSEMER PLATE MARKED 8.

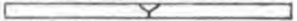
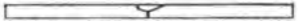
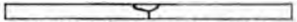
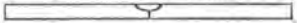
[Chemical composition: Carbon, .47; manganese, .620; silicon, .363. End supports 8″ apart.]

No. of test.	Treatment.				Dimensions.		Ultimate strength.		Fracture.
	Color heated to—	Hardened in—		Temper drawn at—	Breadth.	Depth.	Total.	Maximum fiber stress.	
		Fluid.	Temperature.						
			° F.		*Inch.*	*Inch.*	*Pounds.*	*Pounds.*	
132	Natural state				.290	.446	638	133,150	Rapid yielding at 450 pounds. Bent 79° then fractured. Silky 40 per cent on tension side, granular 60 per cent on compression side.
161	Full cherry	Water	170	Not drawn	.424	.4525	1,070	147,760	Bent 65° without fracture.
194	Bright red	do	180	do	.380	.452	1,246	192,930	Bent 25°. Silky.
195	Full cherry	do	180	Not drawn, hammered cold.	.418	.447	1,494	214,610	Do.
158	Low cherry	do	178	Light blue	.416	.4472	984	118,080	Bent 62° without fracture.
133	Bright red	do	123	Full blue	.335	.4428	1,296	237,430	Bent 18° then fractured. Fine granular.
134	do	do	143	do	.336	.442	1,049	192,180	Bent 72° without fracture.
135	do	do	160	do	.325	.4485	1,306	239,630	Bent 45° then fractured.
191	do	do	160	Light blue	.3656	.4487	1,554	259,180	Bent 19°. Silky 25 per cent, granular 75 per cent.
192	do	do	180	do	.404	.4504	1,758	257 270	Brittle. Fine granular.
193	do	do	175	Above light blue	.4075	.4504	2,048	299,700	Bent 25°. Silky.
188	do	Oil	60	Light blue	.374	.4443	1,538	251,100	Bent 41°. Silky 15 per cent, fine granular 85 per cent.
190	do	do	60	Above light blue	.407	.4426	1,560	234,000	Bent 44°. Silky 80 per cent, granular 20 per cent.
189	Very bright red.	do	60	Light blue	.421	.444	1,758	254,320	Bent 25°. Silky 5 per cent, granular 95 per cent.

SPECIMENS FROM BESSEMER PLATE MARKED 5.

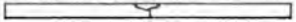
[Chemical composition: Carbon, .48; manganese, 1.25; silicon, .068. End supports 8″ apart.]

148	Natural state.				.332	.406	724	159,410	Bent 70° without fracture.
105	Bright red	Water	60	Not drawn	.440	.414	445	71,200	No perceptible permanent bend. Fine granular. Seam at middle of thickness ″.30 deep.
169	Full blood red	do	105	Light blue	.351	.412	750	151.260	Bent 60° without fracture.
155	Low cherry red.	do	175	do	.386	.411	560	103 380	Fine granular. Hardening crack.
162	do	do	175	Above light blue	.346	.406	1,487	313,050	Fine granular; brittle.

106	Bright red	...do	60	Deep straw	.428	.411	768	127,120	No perceptible permanent bend. Fine granular. Seam at middle of thickness. Hardening crack ".05 deep from compression surface.
107	....do	...do	60	Purple	.468	.417	995	146,500	No perceptible permanent bend. Medium fine granular. Seam at middle of thickness ".25 deep.
108	....do	...do	60	Full blue	.446	.411	1,305	207,420	No perceptible permanent bend. Fine granular. Seam at middle of thickness ".25 deep.
165	Blood red	Oil	60	Not drawn	.359	.410	805	160,070	Bent 64° without fracture.
109	Bright red	...do	60	......do	.501	.4125	1,698	239,720	No perceptible permanent bend. Fine granular. Triangular piece detached from compression side of bend. 
164	Full blood red	...do	60	Light blue	.383	.410	806	150,190	Bent 72° without fracture.
163	Low cherry	...do	60	Above light blue	.450	.413	2,052	320,830	Fine granular. Hardening crack.
154	Cherry red	...do	60	Light blue	.427	.407	1,982	337,360	Fine granular.
170	Full cherry	...do	55	Above light blue	.319	.408	1,238	280,300	Fine granular, brittle. 
110	Bright red	...do	60	Deep straw	.441	.4105	2,041	328,750	Bent about 2°. Fine granular. Triangular piece detached from compression side of bend. 
111	....do	...do	60	Dark purple	.473	.410	1,616	243,920	Bent about 2°. Medium fine granular. Triangular piece detached from compression side of bend. 
112	....do	...do	60	Light blue	.511	.4124	2,200	303,450	Do.

SPECIMENS FROM BESSEMER PLATE MARKED 9.

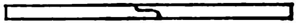
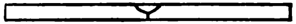
[Chemical composition: Carbon, .48; manganese, 1.25; silicon, .068. End supports 8" apart.]

119	Bright red	Oil	60	Purple	.367	.410	1,532	298,930	No perceptible permanent bend. Fine granular. Triangular piece detached from compression side of bend. 
120	....do	...do	60	Full blue	.440	.409	1,924	314,120	
121	....do	...do	60	Light blue	.358	.405	1,446	296,620	

The fourth strip taken from this plate was quenched in oil and split through the middle of the thickness of the plate a distance of 7". This crack occurred after quenching, and developed during the night. The strip was intact one and one-half hours after quenching and was found cracked in the morning, fourteen hours later.

SPECIMENS FROM BESSEMER PLATE MARKED 2.

[Chemical composition: Carbon, .59; manganese, 1.04; silicon, .28. End supports 8″ apart.]

No. of test.	Treatment.				Dimensions.		Ultimate strength.		Fracture.
	Color heated to—	Hardened in—		Temper drawn at—	Breadth.	Depth.	Total.	Maximum fiber stress.	
		Fluid.	Temperature.						
			°F.		*Inch.*	*Inch.*	*Pounds.*	*Pounds.*	
149	Natural state.				.350	.453	1,048	175,280	Bent 75° without fracture.
168	Low cherry ..	Water ..	105	Light blue	.317	.451	986	183,870	Bent 45° without fracture.
151	Cherry red ...	...do	157	......do	.395	.454	1,964	289,180	Fine granular 
153	....do	...do	152	Light blue, twice.....	.369	.454	2,071	327,000	Fine granular.
166	Blood red.....	Oil......	60	Not drawn	.395	.453	1,138	168,590	Bent 56° without fracture.
167	Low cherry...	...do	60	Light blue............	.440	.4535	1,262	167,340	Bent 53° without fracture.
150	Cherry red ...	...do	64	......do	.423	.449	2,298	324,420	Fine granular 
152	....do	...do	66	Light blue, twice.....	.352	.453	1,428	238,000	Medium fine gronular.

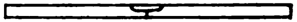
SPECIMENS FROM OPEN HEARTH PLATE MARKED 3.

[Chemical composition: Carbon, .60; manganese, .422; silicon, .105. End supports 8″ apart.]

113	Natural state.				.475	.4518	1,284	158,850	Bent 66° without fracture.
138	Bright red....	Water..	147	Full blue	.267	.451	1,320	291,440	Granular, brittle. Hardening crack.
141	....do	Salt water.	152	......do	.395	.449	1,500	225,560	Do.
140	....do	Oil......	42	Not drawn.............	.304	.453	1,105	212,840	Bent 51° without fracture.
114	....do	...do	60	Light straw	.402	.4494	1,552	229,930	Bent 54° without fracture.
115	....do	...do	60	Straw to purple	.485	.450	1,950	238,780	Bent 48° without fracture.
116	....do	...do	60	Purple to blue.........	.489	.453	2,056	246,720	Bent 81° without fracture.
117	....do	...do	60	Full blue..............	.488	.448	1,985	243,060	Bent 69° without fracture.
139	....do	...do	47	......do	.336	.446	1,290	231,560	Bent 59° without fracture.
118	....do	...do	60	Light blue.............	.380	.445	1,522	243,520	Bent 72° without fracture.

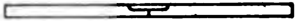
SPECIMENS FROM OPEN HEARTH PLATE MARKED 7.

[Chemical composition: Carbon, .60; manganese, .422; silicon, .105. End supports 8″ apart.]

157	Cherry red ...	Water ..	177	Not drawn............	.421	.455	1,020	140,690	Bent 70° without fracture.
156	....do	...do	170	Light blue............	.4095	.452	1,148	164,980	Bent 76° without fracture.
160	....do	...do	176	......do	.353	.448	946	164,520	Bent 75° without fracture.
125	Bright red....	...do	200	Not drawn............	.287	.4508	980	202,760	Rapid yielding began at 600 pounds. Bent 66° without fracture.
122	....do	...do	50	Full blue	.338	.449	1,118	197,290	No appreciable permanent bend. Medium fine granular. Hardening crack .″2 wide along middle of thickness.
124	....do	...do	200	......do	.341	.448	1,210	211,970	Rapid yielding began at 680 pounds. Bent 55° without fracture.
128	....do	...do	50	Light blue............	.326	.448	1,366	250,260	No appreciable permanent bend. Medium fine granular. Hardening crack ″.25 wide along middle of thickness.
174	....do	...do	170	Above light blue......	.407	.4470	2,036	300,520	Fine granular.
181	....do	...do	180	......do	.383	.4525	1,962	303,870	Silky, interspersed with fine granulation. Bent 30°. Two hardening cracks.
179	....do	...do	181	......do	.359	.452	1,726	283,730	Fine granular. Bent 28°.
180	....do	Salt water.	162	......do	.376	.451	1,489	234,180	Silky. Bent 53°.
175	....do	...do	160	......do	.341	.449	1,914	334,080	Fine granular. 
173	....do	Oil	60	Light blue............	.383	.450	1,621	250,990	Fine granular. Bent 32°.
178	....do	...do	65	......do	.384	.450	1,639	252,810	Fine granular. Bent 30°.

SPECIMENS FROM OPEN HEARTH PLATE MARKED 0.

[Chemical composition: Carbon, .70; manganese, .460; silicon, .127. End supports, 8″ apart.]

171	Full cherry ...	Water ..	192	Light blue............	.360	.443	1,496	254,640	Coarse, granular, brittle. Hardening crack.
95	Bright red....	...do	60	Dark straw............	.406	.445	588	72,000	Medium fine granular. Bent 2°.
96	....do	...do	60	Purple to blue........	.434	.4495	912	125,070	No perceptible permanent bend. Fine granular.
97	....do	...do	60	Full blue.............	.418	.4455	689	100,220	No perceptible permanent bend. Fine granular. Hardening crack at corner on compression side.
98	....do	...do	60	Light blue............	.360	.445	1,215	194,400	No perceptible permanent bend. Medium fine granular. Seam at middle of thickness of plate.
159	Full cherry ...	Oil......	90	......do	.376	.442	2,000	327,420	Fine granular.
172	....do	...do	55	Above light blue	.353	.444	1,980	341,870	Fine granular. Bent about 6°. 
99	Bright red	...do	60	Light straw	.428	.447	1,252	175,720	Fine granular. No perceptible permanent bend.
100	....do	...do	60	Dark purple	.383	.4425	1,478	236,480	Do.
101	....do	...do	60	Purple to blue........	.401	.445	1,698	256,300	Bent 38° without fracture.
102	....do	...do	60	Light blue............	.363	.4435	839	140,810	No perceptible permanent bend. Medium fine granular.

SPECIMENS FROM OPEN HEARTH PLATE MARKED 6.

[Chemical composition: Carbon, .70; manganese, .460; silicon, .127. End supports 8″ apart.]

No. of test.	Treatment.				Dimensions.		Ultimate strength.		Fracture.
	Color heated to—	Hardened in—		Temper drawn at—	Breadth.	Depth.	Total.	Maximum fiber stress.	
		Fluid.	Temperature.						
				°F.	*Inch.*	*Inch.*	*Pounds.*	*Pounds.*	
103		Natural state.			.392	.4465	1,162	178,760	Bent 38°. Medium fine granular, dull corner on tension side.
146	Bright red	Water	150	Full blue	.355	.445	1,320	225,320	Granular, brittle. Hardening crack.
104	do	Oil	60	do	.400	.4455	1,896	288,000	Bent 53°. Medium fine granular, dull corner on tension side.
147	do	do	130	Light blue	.269	.4426	1,268	289,830	Bent 56° without fracture.

SPECIMENS FROM TWO BARS OF SPRING STEEL.

[Chemical composition: Carbon, .621; manganese, .582; silicon, .075. End supports 8″ apart.]

No. of test.	Color heated to—	Fluid.	Temperature.	Temper drawn at—	Breadth.	Depth.	Total.	Maximum fiber stress.	Fracture.
187	Cherry red	Water	180	Not drawn	.439	.444	1,784	247,490	Fine granular. Bent 60°.
184	do	do	185	do	.438	.452	1,422	190,980	Bent 77° without fracture.
177	Low cherry	Oil	70	Above light blue	.436	.453	1,746	234,230	Bent 62° without fracture. Held on anvil and bent 99° when fracture occurred. Fine granular.
185	Cherry red	do	85	Light blue	.434	.441	1,486	211,280	Fine granular, brittle.
186	do	do	85	do	.392	.386	1,418	291,370	Do.
176	do	do		Blazed off twice in oil				311,700	Fine granular. Bent 48°.
182	do	do		do	.440	.442	2,176	304,340	Fine granular. Bent 45°.
183	do	do		Blazed off three times in oil. Finally heated to straw.	.465	.448	2,210	303,790	Bent 67° without fracture.

TEMPERED STEEL STRIPS. BELLEVILLE SPRINGS EXPERIMENTAL METAL.

DETAILS OF TRANSVERSE TESTS.

Applied loads.	Deflections for test specimens numbered—																
	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
200	.0241	.0200	.0205	.0145	.0195	.0230	.0216	.0198	.0220	.0225	.0315	.0200	.0165	.0175	.0140	.0175	.0210
300	.0435	.0350	.0355	.0290	.0347	.0347	.0378	.0345	.0402	.0412	.0645	.0345	.0270	.0295	.0320	.0320	.0358
400	.0640	.0525	.0533	.0433	.0520	.0535	.0542	.0520	.0540	.0635	.1290	.0500	.0420	.0435	.0462	.0455	.0530
500	.0854	.0690	.0705	.0570	.0683	.0745	.0755	.0680	.0695	.0825	.2900	.0712	.0541	.0568	.0628	.0598	.0700
600	.1033	.0850	.0886	.0700	.0850	.0840	.1021	.0880	.0860	.1051	....	.1144	.0675	.0705	.0760	.0735	.0656
700	.1260	.1025	.1300	.0833	.1108	.1033	.1880	.1070	.1008	.1330	....	.2520	.0792	.0865	.0945	.0873	.1020
800	.1465	.1210	.2121	.0958	.1705	.1312	....	.1725	.1170	.1625	....	....	.0930	.1010	.1200	.0990	.1185
900	.1670	.1565	....	.1100	.2840	.1975	....	....	.1340	.1991	....	....	.1055	.1142	.1585	.1160	.1385
1,000	.1868	.2340	....	.1225	....	....	....	....	.1485	.2950	....	....	.1190	.1308	.1970	.1285	.1540
1,100	.2140	.3660	....	.1370	....	....	....	....	.1635	.4250	....	....	.1318	.1475	.2395	.1420	.1698
1,200	.2375	....	....	.1505	....	....	....	....	.1800	....	....	....	.1472	.1702	.3200	.1555	.1875
1,300	.2685	....	....	.1630	....	....	....	....	.1980	....	....	....	.1645	.1950	.3760	.1710	.2050
1,400	....	....	....	.1775	....	....	....	....	....	....	....	....	.1835	.2225	.4750	.1835	.2230
1,428	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.5100	....	....
1,500	....	....	....	.1900	....	....	....	....	....	....	....	....	.2048	.2503	....	.2000	.2455
1,600	....	....	....	....	....	....	....	....	....	....	....	....	.2220	.2870	....	.2198	.2690
1,700	....	....	....	....	....	....	....	....	....	....	....	....	.2430	.3290	....	.2360	.2985
1,800	....	....	....	....	....	....	....	....	....	....	....	....	.2725	.3805	....	.2570	.3365
1,900	....	....	....	....	....	....	....	....	....	....	....	....	.3038	.4360	....	.2815	.3840
1,964	....	....	....	....	....	....	....	....	....	....	....	....	....	.4800	....	....	....
1,982	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.3120	.4400
2,000	....	....	....	....	....	....	....	....	....	....	....	....	.3340	....	....	.3300	....
2,071	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
2,100	....	....	....	....	....	....	....	....	....	....	....	....	.3800	....	....	....	....
2,200	....	....	....	....	....	....	....	....	....	....	....	....	.4280	....	....	....	....
2,298	....	....	....	....	....	....	....	....	....	....	....	....	.5000	....	....	....	....

DETAILS OF TRANSVERSE TESTS—Continued.

Applied loads.	Deflections for test specimens numbered—																
	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
200	.0260	.0160	.0170	.0161	.0210	.0200	.0178	.0280	.0195	.0226	.0235	.0165	.0144	.0224	.0240	.0270	.0224
300	.0428	.0290	.0312	.0320	.0355	.0380	.0276	.0460	.0345	.0405	.0438	.0308	.0265	.0355	.0428	.0499	.0352
400	.0661	.0425	.0445	.0440	.0505	.0495	.0428	.0664	.0498	.0638	.0648	.0453	.0376	.0590	.0780	.0712	.0526
500	.0850	.0572	.0572	.0594	.0653	.0925	.0531	.0865	.0640	.1375	.1470	.0620	.0510	.0865	.1950	.0930	.0670
600	....	.0755	.1860	.1250	.0798	.2400	.1123	.1130	.0788	.3900	....	.0760	.0654	.1560	....	.1140	.0831
700	....	.1720	....	.2100	.0945	....	.2780	.1270	.0960	....	....	.1280	.0880	....	....	.1348	.0996
800	....	.2690	....	....	.1060	....	....	.1535	.1112	....	....	.2585	.1810	....	....	.1564	.1145
900	....	....	....	....	.1230	....	....	.1730	.1310	....	....	....	....	....	....	.1785	.1320
1,000	....	....	....	....	.1390	....	....	.1976	.1426	....	....	....	....	....	....	.2035	.1482
1,100	....	....	....	....	.1535	....	....	.2243	.1618	....	....	....	....	....	....	.2325	.1664
1,200	....	....	....	....	.1685	....	....	.2585	.1766	....	....	....	....	....	....	.2700	.1826
1,238	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.3000	....
1,300	....	....	....	....	.1825	....	....	.3045	.1965	....	....	....	....	....	....	....	.2005
1,400	....	....	....	....	.2000	....	....	.3830	.2143	....	....	....	....	....	....	....	.2192
1,500	....	....	....	....	.2190	....	....	....	.2370	....	....	....	....	....	....	....	....
1,600	....	....	....	....	.2410	....	....	....	.2604	....	....	....	....	....	....	....	....
1,700	....	....	....	....	.2685	....	....	....	.2860	....	....	....	....	....	....	....	....
1,800	....	....	....	....	.3050	....	....	....	.3230	....	....	....	....	....	....	....	....
1,900	....	....	....	....	.3523	....	....	....	.3715	....	....	....	....	....	....	....	....
2,000	....	....	....	....	.4430	....	....	....	.4480	....	....	....	....	....	....	....	....

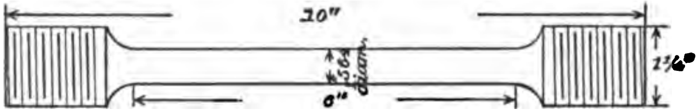
DETAILS OF TRANSVERSE TESTS—Continued.

Applied loads.	Deflection for test specimens numbered—																							
	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200	.0173	.0172	.0170	.0235	.0195	.0185	.0198	.0200	.0200	.0215	.0176	.0185	.0195	.0210	.0260	.0196	.0216	.0190	.0230	.0209	.0170	.0192	.0220	.0200
300	.0340	.0300	.0312	.0365	.0324	.0290	.0318	.0326	.0320	.0320	.0310	.0360	.0344	.0360	.0455	.0305	.0348	.0300	.0350	.0348	.0291	.0309	.0345	.0320
400	.0500	.0465	.0446	.0524	.0470	.0432	.0510	.0480	.0490	.0461	.0449	.0490	.0490	.0493	.0688	.0453	.0510	.0432	.0484	.0510	.0432	.0445	.0500	.0465
500	.0660	.0600	.0550	.0668	.0612	.0555	.0662	.0612	.0605	.0590	.0575	.0621	.0630	.0626	.0880	.0578	.0662	.0555	.0618	.0642	.0550	.0564	.0647	.0618
600	.0815	.0738	.0720	.0825	.0748	.0660	.0774	.0776	.0755	.0738	.0724	.0765	.0762	.0755	.1082	.0711	.0809	.0702	.0755	.0793	.0689	.0633	.0800	.0768
700	.0965	.0878	.0858	.0974	.0894	.0783	.0912	.0912	.0905	.0898	.0855	.0890	.1048	.0694	.1342	.0840	.0980	.0821	.0885	.0955	.0820	.0838	.0991	.0950
800	.1126	.1035	.0975	.1145	.1040	.0925	.1053	.1069	.1036	.1035	.0993	.1028	.1605	.1014	.1530	.0956	.1120	.0952	.1036	.1118	.0943	.0960	.1175	.1200
900	.1290	.1260	.1210	.1330	.1234	.1030	.1205	.1260	.1209	.1161	.1140	.1161	.2710	.1162	.1750	.1109	.1309	.1098	.1152	.1352	.1078	.1092	.1520	.1410
1,000	.1462	.1375	.1305	.1470	.1355	.1208	.1410	.1420	.1420	.1285	.1280	.1345	.3735	.1287	.2000	.1280	.1532	.1280	.1312	.1538	.1237	.1200	.2605	.1711
1,100	.1600	.1765	.1400	.1648	.1548	.1335	.1735	.1635	.1660	.1425	.1491	.1486	......	.1470	.2330	.1672	.1912	.1480	.1530	.1943	.1380	.1349	.3540	.2090
1,200	.1770	.2260	.1503	.1810	.1753	.1650	.2330	.1900	.2248	.1580	.1624	.1652	......	.1592	.2825	.2175	.2410	.1780	.2118	.2580	.1512	.1472	......	.2740
1,300	.1948	.3175	.1630	.1914	.2018	.2760	.3160	.2220	.3480	.1760	.1830	.1870	......	.1738	.3560	.2950	.3385	.2190	.3325	.3385	.1648	.1603	......	.3590
1,400	.2120	......	.1785	.2148	.2390	.3855	......	.2815	......	.1905	.2080	.2116	......	.1870	.4600	.3860	.4900	.2798	......	......	.1809	.1800	......	......
1,500	.2340	......	.1950	.2368	.2935	......	......	.3840	......	.2122	.2430	.2458	......	......	......	......	......	.3710	......	......	.1950	.1970	......	......
1,600	.2630	......	.2120	.2700	.3630	......	......	......	......	.2425	.2910	.2840	......	......	......	......	......	......	......	......	.2130	.2205	......	......
1,700	.2900	......	.2335	.3105	.4375	......	......	......	......	.2900	.3425	.3380	......	......	......	......	......	......	......	......	.2340	.2480	......	......
1,800	.3520	......	.2620	.3800	.5320	......	......	......	......	.3490	.4220	.4081	......	......	......	......	......	......	......	......	......	.2925	......	......
1,900	.4410	......	.2990	.4920	.6300	......	......	......	......	.4800	......	......	......	......	......	......	......	......	......	......	......	.3950	......	......
1,914	......	......	......	.5200	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
1,980	.5900	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
2,000	......	......	.3480	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	.5700	......	......
2,036	......	......	.3800	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

TENSILE TESTS OF HARDENED AND TEMPERED STEEL BARS.

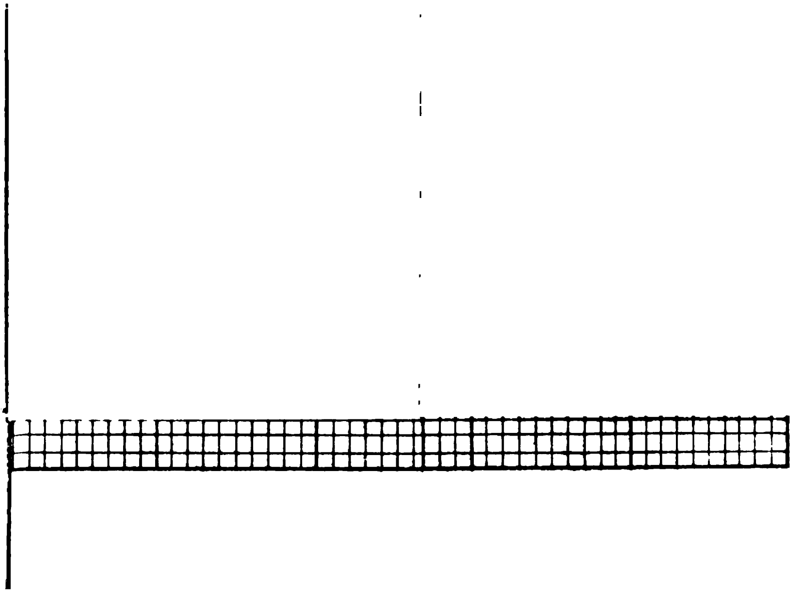
[Material from second series, temperature tests.]

The specimens were heated uniformly, within a piece of gas pipe which was directly exposed to the forge fire, to a bright red, and then quenched in water or oil. The temper was drawn over gas-burners and the specimen cooled in oil.

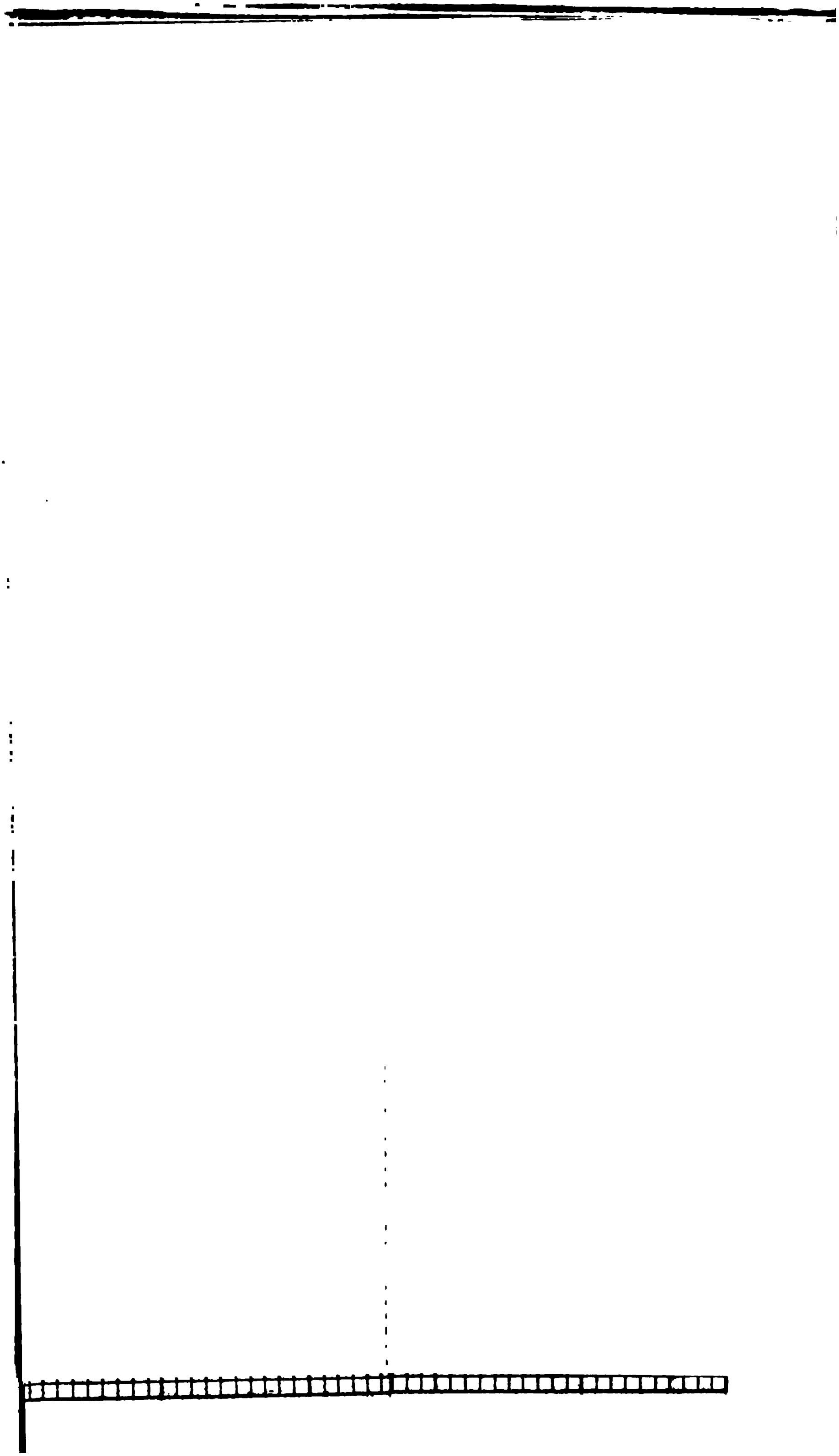


Sectional area, .25 square inch.

No. of test.	Marks.	Hardened in—	Temper drawn at—	Tensile strength.		Area at fracture.	Contraction of area.	Fracture.
				Total.	Per square inch.			
				Pounds.	*Pounds.*		*Per cent.*	
5555	10	Water	Not drawn	18,870	75,480		Inappreciable	".7 from middle of stem. Fine granular.
5556	10	do	Purple and blue color	25,480	101,920	" □"	do	1" from neck. Fine granular.
5557	10	do	Full blue. (Brilliant color)	37,670	150,680	Diam., .560=.246	1.6	".5 from neck. Fine granular.
5558	10	do	do	36,540	146,160	Diam., .562=.248	0.8	¼" from middle of stem. Fine granular.
5559	10	do	do	17,950	71,800		Inappreciable	⅛" from neck. Fine granular.
5560	10	Oil	Not drawn	27,950	111,800	Diam., .440=.152	39.2	At neck. Silky, interspersed with fine granulation.
5561	15	Water	do	10,810	43,240		Inappreciable	¼" from middle of stem. Fine granular.
5562	15	do	Full blue	26,960	117,840		do	1" from neck. Fine granular.
5563	15	do	Light blue	31,750	127,000		do	¾" from neck. Fine granular.
5564	15	do	Above light blue	28,100	112,400		do	⅛" from neck. Fine granular.
5565	15	Oil	Not drawn	33,520	134,080		do	".4 from middle of stem. Fine granular.



[redacted] TEMPERED STEEL

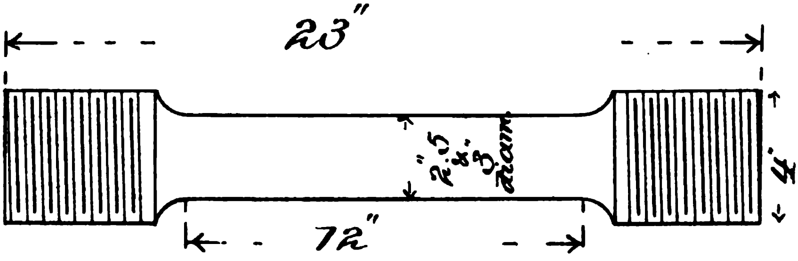


ALTERNATE AND REPEATED STRAINING

OF

STEEL, WROUGHT-IRON, AND CAST-IRON BARS.

Form of specimens for alternate Tensile and Compressive stresses



CHEMICAL COMPOSITION OF MATERIAL USED IN ALTERNATE STRAINING TESTS.

No. of test.	Material.	Marks.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
			Total.	Graphitic.	Combined.					
2764	Steel.............	$S\,B_1$ $L_1\,M$	0.435	0.035	0.400	0.750	0.151	0.023	0.021	0.010
2760	....do	$S\,B_1$ $L_2\,M$ N_1	0.529	0.049	0.480	0.660	0.193	0.032	0.032	0.017
2761	....do	$S\,B_1$ $L_2\,M$ N_1	0.463	0.017	0.446	0.561	0.160	0.043	0.031	0.020
2762	....do	N 191 R	0.558	0.027	0.531	0.656	0.195	0.038	0.033	0.018
2763	....do	N 191 R	0.462	0.020	0.442	0.669	0.169	0.039	0.031	0.022
5762	Steel railroad axle	....	0.156	0.018	0.138	0.834	0.006	0.115	0.092	0.305
5085	Wrought iron....	....	0.027	0.002	0.025	None .	0.035	0.015	0.105	0.075
5763	Cold rolled iron..	A.	0.060	None .	0.060	None .	0.232	0.012	0.133	0.016
5764	....do	B.	0.062	None .	0.062	None .	0.230	0.014	0.136	0.016
5088	Cast iron	1b.	2.811	2.301	0.510	0.713	0.653	0.020	0.515	0.008
5516	....do	II B 2	2.963	2.762	0.201	0.881	0.767	0.081	0.556	0.006

No. 2764.

MIDVALE STEEL BAR.

Marked $^{S\,B_1}_{L_1\,M}$

(See Report 1889, page 311, for the first part of this test.)

Bar rested three months and three days, then annealed in an oil bath at temperature of 340 F. Maintained at this temperature two hours, then slowly cooled in the oil.

The heating was slowly done, requiring three hours' time.

Measurements taken on three gauged lengths 120° apart before and after annealing.

Number of gauged length.	Before annealing.	After annealing.	Difference.
	Inches.	*Inches.*	*Inch.*
1.................	10.0064	10.0060	—.0004
2.................	10.0022	10.0022	0
3.................	10.0434	10.0435	+.0001
Mean..........	10.0173	10.0172	—.0001

After annealing, the bar rested two years and two months; the test then resumed.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	......	......	.00280	......	......	......	......	......	Micrometer reset to last reading preceding annealing.
35, 340	5, 000	.00299	.00019	.00280	0	......	......	......	......	
35, 340	5, 000	......	......	......	......	—.00269	.00030	—.00280	0	
70, 680	10, 000	.00315	.00046	.00280	0	......	......	......	......	
70, 680	10, 000	......	......	......	......	—.00252	.00063	—.00280	0	
106, 020	15, 000	.00331	.00079	.00280	0	......	......	......	......	
106, 020	15, 000	......	......	......	......	—.00236	.00095	—.00280	0	
141, 360	20, 000	.00351	.00115	.00280	0	......	......	......	......	
141, 360	20, 000	......	......	......	......	—.00221	.00130	—.00280	0	
176, 700	25, 000	.00365	.00144	.00281	.00001	......	......	......	......	
176, 700	25, 000	......	......	......	......	—.00202	.00163	—.00281	0	
212, 040	30, 000	.00388	.00186	.00281	0	......	......	......	......	
212. 040	30, 000	......	......	......	......	—.00185	.00203	—.00281	0	
247. 380	35, 000	.00408	.00223	.00281	0	......	......	......	......	
247, 380	35, 000	......	......	......	......	—.00163	.00245	—.00280	.00001	
282, 720	40, 000	.00438	.00275	.00280	0	......	......	......	......	
282, 720	40, 000	......	......	......	......	—.00142	.00296	—.00280	0	
318, 060	45, 000	.00460	.00318	.00290	.00010	......	......	......	......	
318, 060	45, 000	......	......	......	......	—.00117	.00348	—.00280	.00010	
353, 400	50, 000	.01332	.01215	.01111	.00831	......	......	......	......	
35, 340	5, 000	......	......	......	......	—.01080	.00252	—.01101	.00010	
70, 680	10, 000	......	......	......	......	—.01051	.00029	—.01089	.00012	
106, 020	15, 000	......	......	......	......	—.01017	.00034	—.01072	.00017	
141, 360	20, 000	......	......	......	......	—.00972	.00045	—.01045	.00027	
176, 700	25, 000	......	......	......	......	—.00912	.00060	—.01004	.00041	
212, 040	30, 000	......	......	......	......	—.00830	.00082	—.00943	.00061	
247, 380	35, 000	......	......	......	......	—.00712	.00118	—.00845	.00098	
282, 720	40, 000	......	......	......	......	—.00534	.00178	—.00690	.00155	
318, 060	45, 000	......	......	......	......	—.00282	.00252	—.00460	.00230	
353, 400	50, 000	......	......	......	......	+.00118	.00400	—.00085	.00375	
35, 340	5, 000	.00108	.00226	.00092	.00007	......	......	......	......	
70, 680	10, 000	.00137	.00029	.00100	.00008	......	......	......	......	
106, 020	15, 000	.00165	.00028	.00114	.00014	......	......	......	......	
141, 360	20, 000	.00202	.00037	.00132	.00018	......	......	......	......	
176, 700	25, 000	.00232	.00050	.00157	.00025	......	......	......	......	
212, 040	30, 000	.00319	.00067	.00201	.00044	......	......	......	......	
247, 380	35, 000	.00413	.00094	.00275	.00074	......	......	......	......	

282,720	40,000	.00560	.00147	.00400	.00125	....	....	....	....
318,060	45,000	.00809	.00249	.00622	.00222	....	....	....	....
353,400	50,000	.01250	.00441	.01030	.00408	....	....	....	....
70,680	10,000	....	....	....	....	−.00971	.00279	−.01010	.00020
212,040	30,000	....	....	....	....	−.00775	.00196	−.00890	.00120
353,400	50,000	....	....	....	....	+.00075	.00850	−.00133	.00757

Rested without load seven months.
Stem turned down to 2″.247 diameter and test completed by tension
Sectional area, 3.97 square inches.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
3,970	1,000	0.	0.	0.	0.	Initial load.
19,850	5,000	.00015	.00015	0.	....	Micrometer reset to zero.
39,700	10,000	.00032	.00017	.00001	.00001	
59,550	15,000	.00049	.00017	.00001	0.	
79,400	20,000	.00067	.00018	.00003	.00002	
99,250	25,000	.00089	.00022	.00008	.00005	
119,100	30,000	.00120	.00031	.00021	.00013	
138,950	35,000	.00176	.00056	.00056	.00035	
158,800	40,000	.00280	.00104	.00138	.00082	
178,650	45,000	.00447	.00167	.00282	.00144	
198,500	50,000	.00740	.00293	.00545	.00263	
202,470	51,000	.00801	.00061	....	....	
206,440	52,000	.00865	.00064	....	....	
210,410	53,000	.00954	.00089	....	....	
214,380	54,000	.01051	.00097	....	....	
218,350	55,000	.01179	.00128	.00950	.00405	
222,320	56,000	.01308	.00129	....	....	
226,290	57,000	.01455	.00147	....	....	
230,260	58,000	.01610	.00155	....	....	
234,230	59,000	.01824	.00214	....	....	
238,200	60,000	.02007	.00183	.01740	.00790	
242,170	61,000	.022	.00193	....	....	
246,140	62,000	.024	.002	....	....	
250,110	63,000	.026	.002	....	....	
254,080	64,000	.030	.004	....	....	
258,050	65,000	.033	.003	....	....	
262,020	66,000	.036	.003	....	....	
265,990	67,000	.038	.002	....	....	
269,960	68,000	.042	.004	....	....	
273,930	69,000	.046	.004	....	....	
277,900	70,000	.050	.004	....	....	
281,870	71,000	.056	.006	....	....	
285,840	72,000	.063	.007	....	....	
289,810	73,000	.070	.007	....	....	
293,780	74,000	.085	.015	....	....	
297,750	75,000	.109	.024	....	....	
299,620	75,470	.144	.035	....	....	Tensile strength.
241,600	....	....	....	....	....	Load at time of rupture.

General summary.

Tensile strength per square inch of original section....................................pounds.. 75,47
Elongation per inch after rupture..inch.. .29
Reduction in diameter at point of rupture..do... .75
Reduction in area after rupture, per cent of original section...................................... 56.
Position of rupture ....5″.8 from neck
Character of broken surface ......silky, with deep radial serrations; surface of stem slightly seamy
Elongation of inch sections........................″.14, ″.19, ″.27, ″.70*, ″.66*, ″.27, ″.22, ″.17, ″.16, ″.1

No. 2760.

STEEL BAR.

Marks, $\underset{N_1}{\overset{S\,B_1}{L_1\,M}}$

Diameter, 3″; sectional area, 7.068 square inches. } Original.
Gauged length, 10″. }

See Report 1889, page 298, and Report 1890, page 687, for earlier parts of this test.
Test resumed after resting without load a period of two years and two months.
Last load previous to rest, 50,000 pounds per square inch tension.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0							—.00092		Micrometer reset to last reading preceding rest.
35, 340	5, 000					—.00078	.00014	—.00092	0.	
70, 680	10, 000					—.00067	.00011	—.00093	—.00001	
106, 020	15, 000					—.00051	.00016	—.00096	—.00003	
141, 360	20, 000					—.00034	.00017	—.00093	+.00003	
176, 700	25, 000					—.00019	.00015	—.00096	—.00003	
212, 040	30, 000					.00000	.00019	—.00095	+.00001	
247, 380	35, 000					+.00022	.00022	—.00090	.00005	
282, 720	40, 000					.00057	.00035	—.00075	.00015	
35, 340	5, 000	.00087	.00144	.00073	—.00002					
70, 680	10, 000	.00104	.00017	.00073	0.					
106, 020	15, 000	.00122	.00018	.00074	+.00001					
141, 360	20, 000	.00139	.00017	.00077	.00003					
176, 700	25, 000	.00160	.00021	.00078	.00001					
212, 040	30, 000	.00180	.00020	.00081	.00003					
247, 380	35, 000	.00203	.00023	.00083	.00002					
282, 720	40, 000	.00230	.00027	.00089	.00006					
318, 060	45, 000	.00258	.00028	.00093	.00004					
325, 128	46, 000	.00265	.00007							
332, 196	47, 000	.00270	.00005							
339, 264	48, 000	.00278	.00008							
346, 332	49, 000	.00284	.00006							
353, 400	50, 000	.00292	.00008	.00102	.00009					
360, 468	51, 000	.00299	.00007							
367, 536	52, 000	.00334	.00035							

No. 2760—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
Total.	Per square inch.	Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
		Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds. 374,604	*Pounds.* 53,000	*Inch.* .00510	*Inch.* .00176	*Inch.* .00297	*Inch.* .00195	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,340	5,000					—.00281	.00220	—.00293	.00004	
70,680	10,000					—.00259	.00022	—.00288	.00005	
106,020	15,000					—.00233	.00026	—.00279	.00009	
141,360	20,000					—.00206	.00027	—.00269	.00010	
176,700	25,000					—.00174	.00032	—.00252	.00017	
212,040	30,000					—.00132	.00042	—.00231	.00021	
247,380	35,000					—.00077	.00055	—.00197	.00034	
282,720	40,000					—.00005	.00072	—.00147	.00050	
318,060	45,000					+.00101	.00106	—.00064	.00083	
353,400	50,000					.00274	.00173	+.00082	.00146	
35,340	5,000	—.00068	.00206	—.00083	—.00001					
70,680	10,000	—.00045	.00023	—.00077	+.00006					
106,020	15,000	—.00022	.00023	—.00070	.00007					
141,360	20,000	+.00008	.00030	—.00059	.00011					
176,700	25,000	.00041	.00033	—.00046	.00013					
212,040	30,000	.00082	.00041	—.00025	.00021					
247,380	35,000	.00136	.00054	+.00006	.00031					
282,720	40,000	.00208	.00072	.00056	.00050					

Rested without load seven months.

Stem turned down to 2''.262 diameter and test resumed by tension.

Sectional area, 4.02 square inches.

Gauged length, 10''.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
4,020	1,000	0.	0.	0.	0.	Initial load. Micrometer reset to zero.
20,100	5,000	.00015	.00015	0.	....	
40,200	10,000	.00031	.00016	.00001	.00001	
60,300	15,000	.00050	.00019	.00001	0.	
80,400	20,000	.00065	.00015	.00001	0.	
100,500	25,000	.00084	.00019	.00001	0.	
120,600	30,000	.00100	.00016	.00001	0.	
140,700	35,000	.00117	.00017	.00001	0.	
160,800	40,000	.00137	.00020	.00001	0.	
164,820	41,000	.00141	.00004	....	....	
168,840	42,000	.00145	.00004	....	....	
172,860	43,000	.00149	.00004	....	....	
176,880	44,000	.00154	.00005	....	....	
180,900	45,000	.00159	.00005	.00002	.00001	
184,920	46,000	.00164	.00005	....	....	
188,940	47,000	.00172	.00008	....	....	
192,960	48,000	.00181	.00009	....	....	
196,980	49,000	.00194	.00013	....	....	
201,000	50,000	.00216	.00022	.00037	.00035	
205,020	51,000	.00250	.00034	....	....	
209,040	52,000	.00286	.00036	....	....	
213,060	53,000	.00345	.00059	....	....	
217,080	54,000	.00408	.00063	....	....	
221,100	55,000	.00490	.00082	.00275	.00238	
225,120	56,000	.00597	.00107	....	....	
229,140	57,000	.00715	.00118	....	....	
233,160	58,000	.00845	.00130	....	....	
237,180	59,000	.01014	.00169	....	....	
241,200	60,000	.01175	.00161	.00915	.00640	
245,220	61,000	.01275	.00100	....	....	
249,240	62,000	.01425	.00150	....	....	
253,260	63,000	.01625	.00200	....	....	
257,280	64,000	.01776	.00151	....	....	
261,300	65,000	.02005	.00229	.01713	.00798	
265,320	66,000	.022	.00195	....	....	
269,340	67,000	.024	.002	....	....	
273,360	68,000	.027	.003	....	....	
277,380	69,000	.030	.003	....	....	
281,400	70,000	.033	.003	....	....	
285,420	71,000	.036	.003	....	....	
289,440	72,000	.039	.003	....	....	
293,460	73,000	.042	.003	....	....	
297,480	74,000	.046	.004	....	....	
301,500	75,000	.051	.005	....	....	
305,520	76,000	.057	.006	....	....	
309,540	77,000	.066	.009	....	....	
313,560	78,000	.078	.012	....	....	
317,580	79,000	.102	.024	....	....	
318,540	79,240	.120	.018	....	....	Tensile strength.

Local contraction went on under diminished stress after the maximum load had been reached.

The test was discontinued when the total load had fallen to 300,000 pounds. At this time the diameter of the stem had contracted to 1''.86 at the smallest place; hence the stress per square inch on the minimum section was 300,000 ÷ 2.72 square inches = 110,290 pounds.

The elongation of the inch sections was as follows: ''.10, ''.13, ''.17, ''.29, ''.42, ''.31, ''.17, ''.14, ''.11, ''.11.

The bar was removed from the testing machine and the stem turned down to a uniform diameter of 1.844 square inches.

Sectional area, 2.67 square inches.

The elongated inch sections were laid off on the stem as they existed before the bar was turned down.

The test was resumed and rupture completed.

Tensile strength, 249,100 pounds=93,290 pounds per square inch.

Load at time of rupture, 207,000 pounds.

Total elongation, 2''.47 in 10 inches=24.7 per cent.

Total elongation of inch sections: ''.14, ''.13, ''.17, ''.29, ''.42, ''.31, ''.17, ''.14, ''.16, ''.54*.

Diameter at fracture, 1''.36. Area, 1.45 square inches.

Contraction of area, 45.7 per cent.

Fractured 1''.20 from neck. Appearance, silky, interspersed with fine granulation. Serrated surface radiating from the center of the bar.

No. 2761.

STEEL BAR.

Marks, $\begin{smallmatrix} S\,B_1 \\ L_3\,M \\ N_1 \end{smallmatrix}$

Diameter, 3.″. Sectional area, 7.068 square inches. } Original.
Gauged length, 10″. }
(See Report 1889, page 304, for earlier part of this test.)
Test resumed after bar had rested without load two years and three months.
Last load previous to annealing at 1,067° F., and interval of rest, 50,000 pounds per square inch tension.
The annealing was done before the interval of rest.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	....	....	.00185	....	....	....	....	....	Micrometer reset to last reading preceding rest.
70, 680	10, 000	.00217	.00032	.00185	.0	....	....	....	....	
70, 680	10, 000	....	....	....	....	—.00153	.00064	—.00185	0.	
141, 360	20, 000	.00250	.00097	.00184	—.00001	....	....	....	....	
141, 360	20, 000	....	....	....	....	—.00122	.00128	—.00185	—.00001	
212, 040	30, 000	.00286	.00164	.00183	—.00002	....	....	....	....	
212, 040	30, 000	....	....	....	....	—.00087	.00199	—.00182	+.00001	
247, 380	35, 000	.00305	.00218	.00184	+.00002	....	....	....	....	
247, 380	35, 000	....	....	....	....	—.00068	.00237	—.00184	0.	
282, 720	40, 000	.00325	.00257	.00184	0.	....	....	....	....	
282, 720	40, 000	....	....	....	....	—.00048	.00257	—.00186	—.00002	
35, 340	5, 000	.00200	.00152	....	....	....	....	....	....	
70, 680	10, 000	.00217	.00017	....	....	....	....	....	....	
106, 020	15, 000	.00233	.00016	....	....	....	....	....	....	
141, 360	20, 000	.00250	.00017	....	....	....	....	....	....	
176, 700	25, 000	.00268	.00018	....	....	....	....	....	....	
212, 040	30, 000	.00285	.00017	....	....	....	....	....	....	
247, 380	35, 000	.00305	.00020	....	....	....	....	....	....	
282, 720	40, 000	.00326	.00021	....	....	....	....	....	....	
318, 060	45, 000	.00349	.00023	....	....	....	....	....	....	
282, 720	40, 000	.00329	—.00020	....	....	....	....	....	....	
247, 380	35, 000	.00308	—.00021	....	....	....	....	....	....	
212, 040	30, 000	.00289	—.00019	....	....	....	....	....	....	

No. 2761—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
176, 700	25, 000	.00271	—.00018	....	....	....	....	....	....	
141, 360	20, 000	.00255	—.00016	....	....	....	....	....	....	
106, 020	15, 000	.00238	—.00017	....	....	....	....	....	....	
70, 680	10, 000	.00220	—.00018	....	....	....	....	....	....	
35, 340	5, 000	.00203	—.00017	.00187	.00001	....	....	....	....	
318, 060	45, 000	....	....	....	....	—.00028	.00175	—.00184	.00003	
325, 128	46, 000	.00354	.00326	....	....	....	....	....	....	
332, 196	47, 000	.00357	.00003	....	....	....	....	....	....	
339, 264	48, 000	.00362	.00005	....	....	....	....	....	....	
346, 332	49, 000	.00368	.00006	....	....	....	....	....	....	
353, 400	50, 000	.00373	.00005	.00190	.00006	....	....	....	....	
353, 400	50, 000	....	....	....	....	.00577	.00950	.00377	.00567	
35, 340	5, 000	—.00350	.00227	—.00368	.00009	....	....	....	....	
70, 680	10, 000	—.00322	.00028	—.00359	.00009	....	....	....	....	Metal along one end of stem drawn down, the other end undisturbed.
106, 020	15, 000	—.00298	.00024	—.00347	.00012	....	....	....	....	
141, 360	20, 000	—.00250	.00048	—.00320	.00027	....	....	....	....	
176, 700	25, 000	—.00194	.00056	—.00282	.00038	....	....	....	....	
212, 040	30, 000	—.00115	.00079	—.00227	.00055	....	....	....	....	
247, 380	35, 000	—.00007	.00108	—.00139	.00088	....	....	....	....	
282, 720	40, 000	+.00152	.00159	—.00007	.00132	....	....	....	....	
318, 060	45, 000	—.00390	.00238	+.00210	.00217	....	....	....	....	
353, 400	50, 000	.00796	.00406	.00582	.00372	....	....	....	....	
70, 680	10, 000	....	....	....	....	—.00526	.00270	—.00563	.00019	
141, 360	20, 000	....	....	....	....	—.00453	.00073	—.00526	.00037	
212, 040	30, 000	....	....	....	....	—.00329	.00124	—.00440	.00086	
282, 720	40, 000	....	....	....	....	—.00080	.00249	—.00232	.00208	
353, 400	50, 000	....	....	....	....	+.00446	.00526	+.00248	.00475	

Rested without load seven months.

Stem turned down to 2″.258 diameter, and test completed by tension.

Sectional area, 4 square inches.

Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
4,000	1,000	0.	0.	0.	0.	Initial load. Micrometer reset to zero.
20,000	5,000	.00015	.00015	0.	....	
40,000	10,000	.00031	.00016	0.	....	
60,000	15,000	.00049	.00018	0.	....	
80,000	20,000	.00066	.00017	.00002	.00002	
100,000	25,000	.00087	.00021	.00005	.00003	
120,000	30,000	.00116	.00029	.00018	.00013	
140,000	35,000	.00169	.00053	.00050	.00032	
160,000	40,000	.00266	.00097	.00129	.00079	
180,000	45,000	.00430	.00164	.00265	.00136	
200,000	50,000	.00688	.00258	.00490	.00225	
204,000	51,000	.00741	.00053	....	....	
208,000	52,000	.00796	.00055	....	....	
212,000	53,000	.00880	.00084	....	....	
216,000	54,000	.00967	.00087	....	....	
220,000	55,000	.01070	.00103	.00844	.00354	
224,000	56,000	.01169	.00099	....	....	
228,000	57,000	.01280	.00111	....	....	
232,000	58,000	.01415	.00135	....	....	
236,000	59,000	.01514	.00099	....	....	
240,000	60,000	.01755	.00241	.01490	.00646	
244,000	61,000	.019	.00145	....	....	
248,000	62,000	.021	.002	....	....	
252,000	63,000	.023	.002	....	....	
256,000	64,000	.025	.002	....	....	
260,000	65,000	.028	.003	....	....	
264,000	66,000	.030	.002	....	....	
268,000	67,000	.032	.002	....	....	
272,000	68,000	.034	.002	....	....	
276,000	69,000	.037	.003	....	....	
280,000	70,000	.040	.003	....	....	
284,000	71,000	.044	.004	....	....	
288,000	72,000	.048	.004	....	....	
292,000	73,000	.053	.005	....	....	
296,000	74,000	.058	.005	....	....	
300,000	75,000	.065	.007	....	....	
304,000	76,000	.074	.009	....	....	
308,000	77,000	.088	.014	....	....	
312,000	78,000	.110	.022	....	....	
313,280	78,320	.135	.025	....	....	Tensile strength.

The test was discontinued after passing the maximum load, when the stress had fallen to 300,000 pounds total load=106,010 pounds per square inch on the minimum section, 1″.90 diameter.

The bar then measured as follows:

Elongation in 10 inches, 1″.95=19.5 per cent.

Elongation of inch sections, ″.13, ″.19, ″.28, ″.38, ″.29, ″.18, ″.15, ″13, ″.11, ″.11.

Minimum diameter, 1″.90. Area, 2.84 square inches.

Contraction of area, 29 per cent.

Bar removed from testing machine and annealed by heating bright red and cooling in the open air.

After cooling, the bar was returned to the testing machine and rupture completed.

Maximum load after annealing, 244,500 pounds=86,400 pounds per square inch on section, which was 1″.90 diameter.

Load at time of rupture, 224,000 pounds=79,150 pounds per square inch on 1″.90 section, or 125,140 pounds per square inch on fractured section.

Total elongation in 10 inches, 3''.15=31.5 per cent.

Elongation of inch sections, ''.17, ''.25, ''.44, ''.94*, ''.45, ''.25, ''.20, ''.18, ''.17, ''.10.

Diameter at fracture, 1''.51. Area, 1.79 square inches.

Total contraction of area, 55.2 per cent.

Fractured 5'' from the neck. Appearance, fine granular, radiating from a dull silky spot ''.50 diameter at the circumference of the bar.

No. 2762.

STEEL BAR.

Marks, $^{N}{}_{R}1''$
Diameter, 3″. Sectional area, 7.068 square inches. } Original.
Gauged length, 10″. }
(See Report 1889, page 307, and Report 1890, page 690, for earlier parts of this test.)
Bar rested two years and two months without load, and test then resumed.
Last load preceding interval of rest, 50,000 pounds per square inch compression.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0			—.00507						Micrometer reset to last reading preceding rest.
35,340	5,000	—.00488	.00019	—.00507	0.					
70,680	10,000	—.00471	.00017	—.00506	.00001					
106,020	15,000	—.00457	.00014	—.00502	.00004					
141,360	20,000	—.00436	.00021	—.00502	0.					
141,360	20,000					.00562	.00126	.00502	0.	
176,700	25,000	—.00418	.00144	—.00500	.00002					
176,700	25,000					.00576	.00158	.00502	.00002	
212,040	30,000	—.00398	.00178	—.00498	.00004					
212,040	30,000					.00590	.00192	.00501	.00003	
212,040	30,000	—.00398	.00192	—.00497	.00004					
212,040	30,000					.00590	.00192	.00501	.00004	
212,040	30,000	—.00395	.00195							
	30,000	—.00394	.00001	—.00492	.00009					After 5 minutes.
212,040	30,000					.00588	.00194			
	30,000					.00587	—.00001	.00497	.00005	Do.
212,040	30,000	—.00394	.00193							
	30,000	—.00393	.00001							Do.
	30,000	—.00390	.00003							After 12 minutes.
	30,000	—.00389	.00001							After 20 minutes.
	30,000	—.00388	.00001							After 25 minutes.
	30,000	—.00388	0.							After 50 minutes.
	30,000	—.00388	0.	—.00488	.00009					After 70 minutes.
212,040	30,000					.00586	.00198			
	30,000					.00584	—.00002	.00492	.00004	After 5 minutes.
212,040	30,000	—.00391	.00193							
		—.00388	.00003							After 10 minutes.

No. 2762—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
		—.00387	.00001	—.00487	.00005					After 20 minutes. Bar rested without load 40 hours.
0	0			—.00487	0.					
212,040	30,000					.00583	.00196			
	30,000					.00583	0.			After 5 minutes.
	30,000					.00583	0.	.00493	.00006	After 10 minutes.
212,040	30,000	—.00392	.00191							
	30,000	—.00390	.00002							After 5 minutes.
	30,000	—.00388	.00002							After 10 minutes.
	30,000	—.00387	.00001							After 20 minutes.
	30,000	—.00387	0.							After 30 minutes.
Load released to 10,000 pounds per square inch tension, and then increased to 30,000 pounds per square inch tension—repeated ten times.										
212,040	30,000	—.00388	—.00001	—.00488	.00005					
212,040	30,000					.00587	.00199			
Load released to 10,000 pounds per square inch compression, and then increased to 30,000 pounds per square inch compression—repeated ten times.										
212,040	30,000					.00587	0.	.00495	.00007	
247,380	35,000	—.00358	.00229	—.00478	.00017					
247,380	35,000					.00599	.00241	.00490	.00012	
282,720	40,000	—.00300	.00299							
	40,000	—.00292	.00008							After 5 minutes.
	40,000	—.00290	.00002							After 10 minutes.
	40,000	—.00289	.00001	—.00431	.00059					After 15 minutes.
282,720	40,000					.00598	.00309			
	40,000					.00597	—.00001	.00470	.00039	After 5 minutes.
282,720	40,000	—.00276	.00321							
	40,000	—.00270	.00006							Do.
	40,000	—.00270	0.	—.00416	.00054					After 10 minutes.
282,720	40,000					.00592	.00322	.00462	.00046	
282,720	40,000	—.00263	.00329							
	40,000	—.00260	.00003	—.00405	.00057					After 5 minutes.
289,788	41,000	—.00250	.00010							
296,856	42,000	—.00238	.00012							
303,924	43,000	—.00205	.00033							
310,992	44,000	—.00175	.00030							
318,060	45,000	—.00135	.00040							
	45,000	—.00109	.00026							Do.
	45,000	—.00103	.00006	—.00277	.00128					After 10 minutes.

318 060	45,000	—.00097	.00006	—.00266	.00011	......	......	......	......	
318,060	45,000	......	......	......	......	.00608	00511	......	......	
318,060	45,000	......	......	......	......	.00616	.00008	.00455	.00189	After 7 minutes.
318,060	45,000	—.00067	.00549	—.00245	.00210	......	......	......	......	

Rested without load seven months.
Stem turned down to 1″.995 diameter, and test completed by tension.
Sectional area, 3.12 square inches.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
3, 120	1, 000	0.	0.	0.	0.	Initial load.
15, 600	5, 000	.00015	.00015	0.	....	
31, 200	10, 000	.00033	.00018	.00001	.00001	
46, 800	15, 000	.00051	.00018	.00002	.00001	
62, 400	20, 000	.00069	.00018	.00002	0.	
78, 000	25, 000	.00084	.00015	.00002	0.	
93, 600	30, 000	.00100	.00016	.00002	0.	
109, 200	35, 000	.00118	.00018	.00002	0.	
124, 800	40, 000	.00135	.00017	.00002	0.	
140, 400	45, 000	.00155	.00020	.00002	0.	
143, 520	46, 000	.00158	.00003	....	....	
146, 640	47, 000	.00162	.00004	....	....	
149, 760	48, 000	.00166	.00004	....	....	
152, 880	49, 000	.00170	.00004	....	....	
156, 000	50, 000	.00175	.00005	.00004	.00002	
159, 120	51, 000	.00180	.00005	....	....	
162, 240	52, 000	.00185	.00005	....	....	
165, 360	53, 000	.00195	.00010	....	....	
168, 480	54, 000	.00220	.00025	....	....	
171, 600	55, 000	.00375	.00155	.00172	.00168	
174, 720	56, 000	.00464	.00089	....	....	
177, 840	57, 000	.00625	.00161	....	....	
180, 960	58, 000	.00730	.00105	....	....	
184, 080	59, 000	.00840	.00110	....	....	
187, 200	60, 000	.01005	.00165	.00760	.00588	
190, 320	61, 000	.01100	.00095	....	....	
193, 440	62, 000	.01223	.00123	....	....	
196, 560	63, 000	.01400	.00177	....	....	
199, 680	64, 000	.01535	.00135	....	....	
202, 800	65, 000	.01675	.00140	.01400	.00640	
205, 920	66, 000	.01825	.00150	....	....	
209, 040	67, 000	.01970	.00150	....	....	
212, 160	68, 000	.022	.00230	....	....	
215, 280	69, 000	.024	.002	....	....	
218, 400	70, 000	.026	.002	....	....	
221, 520	71, 000	.028	.002	....	....	
224, 640	72, 000	.030	.002	....	....	
227, 760	73, 000	.033	.003	....	....	
230, 880	74, 000	.035	.002	....	....	
234, 000	75, 000	.039	.004	....	....	
237, 120	76, 000	.042	.003	....	....	
240, 240	77, 000	.047	.005	....	....	
243, 360	78, 000	.051	.004	....	....	
246, 480	79, 000	.059	.008	....	....	
249, 600	80, 000	.065	.006	....	....	
252, 720	81, 000	.076	.011	....	....	
255, 840	82, 000	.090	.014	....	....	
258, 600	82, 880	.126	.036	....	....	Tensile strength.
232, 700	....	....	....	....	....	Load at time of rupture.

General summary.

Tensile strength per square inch of original section..............................pounds..	82, 880
Elongation per inch after rupture..inch..	.202
Reduction in diameter at point of rupture..do...	.475
Reduction in area after rupture, per cent of original section	42
Position of rupture	4″.4 from neck
Character of broken surface............	fine granular, radiating from a dull silky center ″.50 diameter
Elongation of inch sections	″.09, ″.15, ″.26, ″.57*, ″.32, ″.18, ″.13, ″.12, ″.11, ″.09

No. 2763.

STEEL BAR.

Marks, $^{\mathrm{N}}{}_{\mathrm{R}}{}^{91}$
Diameter, 3″. Sectional area, 7.068 square inches. } Original.
Gauged length, 10″. }
(See Report 1889, page 309, and Report 1890, page 692, for earlier parts of this test.)
Bar rested two years without load, and test then resumed.
Last load before resting, 388,740 pounds tension=55,000 pounds per square inch.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	....	....	....	....	....	....	—.00215	....	Micrometer reset to last reading preceding rest.
35,340	5,000	....	....	....	....	—.00203	.00012	—.00215	0.	
70,680	10,000	....	....	....	....	—.00185	.00018	—.00217	—.00002	
106,020	15,000	....	....	....	....	—.00168	.00017	—.00217	0.	
141,360	20,000	....	....	....	....	—.00152	.00016	—.00217	0.	
176,700	25,000	....	....	....	....	—.00135	.00017	—.00215	+.00002	
212,040	30,000	....	....	....	....	—.00112	.00023	—.00211	.00004	
247,380	35,000	....	....	....	....	—.00076	.00036	—.00195	.00016	
282,720	40,000	....	....	....	....	—.00007	.00069	—.00150	.00045	
318,060	45,000	....	....	....	....	+.00151	.00158	—.00014	.00136	
35,340	5,000	.00029	.00180	.00014	0.	....	....	....	....	
70,680	10,000	.00049	.00020	.00018	.00004	....	....	....	....	
106,020	15,000	.00070	.00021	.00021	.00003	....	....	....	....	
141,360	20,000	.00094	.00024	.00027	.00006	....	....	....	....	
176,700	25,000	.00119	.00025	.00033	.00006	....	....	....	....	
212,040	30,000	.00155	.00036	.00048	.00015	....	....	....	....	
247,380	35,000	.00197	.00042	.00069	.00021	....	....	....	....	
35,340	5,000	....	....	....	....	—.00053	.00144	—.00069	0.	
70,680	10,000	....	....	....	....	—.00034	.00019	—.00068	.00001	
106,020	15,000	....	....	....	....	—.00017	.00017	—.00065	.00008	
141,360	20,000	....	....	....	....	+.00005	.00022	—.00063	.00002	
176,700	25,000	....	....	....	....	.00025	.00020	—.00060	.00003	
212,040	30,000	....	....	....	....	.00048	.00023	—.00055	.00005	
247,380	35,000	....	....	....	....	.00080	.00032	—.00044	.00011	

No. 2763—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
282, 720	40, 000	....	....	....	....	.00116	.00086	—.00029	.00015	
35, 340	5, 000	.00043	.00159	.00027	—.00002	....	....	....	....	
70, 680	10, 000	.00058	.00015	.00027	0.	....	....	....	....	
106, 020	15, 000	.00078	.00020	.00028	.00001	....	....	....	....	
141, 360	20, 000	.00100	.00022	.00032	.00004	....	....	....	....	
176, 700	25, 000	.00123	.00023	.00037	.00005	....	....	....	....	
212, 040	30, 000	.00151	.00028	.00045	.00008	....	....	....	....	Rested without load 15 hours.
247, 380	35, 000	.00180	.00029	.00054	.00009	....	....	....	....	
282, 720	40, 000	.00225	.00045	.00068	.00014	....	....	....	....	
318, 060	45, 000	.00291	.00066	.00120	.00052	....	....	....	....	
353, 400	50, 000	.00392	.00101	.00192	.00072	....	....	....	....	
35, 340	5, 000	....	....	....	....	—.00169	.00223	—.00185	.00007	
70, 680	10, 000	....	....	....	....	—.00145	.00024	—.00180	.00005	
106, 020	15, 000	....	....	....	....	—.00120	.00025	—.00172	.00008	
141, 360	20, 000	....	....	....	....	—.00092	.00028	—.00160	.00012	
176, 700	25, 000	....	....	....	....	—.00060	.00032	—.00147	.00013	
212, 040	30, 000	....	....	....	....	—.00017	.00043	—.00124	.00023	
247, 380	35, 000	....	....	....	....	+.00036	.00053	—.00089	.00035	
282, 720	40, 000	....	....	....	....	.00102	.00066	—.00042	.00047	
318, 060	45, 000	....	....	....	....	.00202	.00100	+.00037	.00079	
353, 400	50, 000	....	....	....	....	.00435	.00233	.00237	.00200	
35, 340	5, 000	—.00216	.00219	—.00232	.00005	....	....	....	....	
70, 680	10, 000	—.00195	.00021	—.00226	.00006	....	....	....	....	
106, 020	15, 000	—.00165	.00030	—.00218	.00008	....	....	....	....	
141, 360	20, 000	—.00135	.00030	—.00207	.00011	....	....	....	....	
176, 700	25, 000	—.00097	.00038	—.00188	.00019	....	....	....	....	
212, 040	30, 000	—.00050	.00047	—.00161	.00027	....	....	....	....	
247, 380	35, 000	+.00012	.00062	—.00121	.00040	....	....	....	....	
282, 720	40, 000	.00093	.00081	—.00063	.00058	....	....	....	....	
318, 060	45, 000	.00212	.00119	+.00031	.00094	....	....	....	....	
353, 400	50, 000	.00397	.00185	.00185	.00134	....	....	....	....	

Rested without load seven months.
Stem turned down to 2″.254 diameter, and test completed by tension.
Sectional area, 3.99 square inches.
New gauged length of 10″ established.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
3,990	1,000	0.	0.	0.	0.	Initial load. Micrometer adjusted to zero.
19,950	5,000	.00013	.00013	0.	....	
39,900	10,000	.00031	.00018	0.	....	
59,850	15,000	.00049	.00018	0.	....	
79,800	20,000	.00064	.00015	0.	....	
99,750	25,000	.00082	.00018	0.	....	
119,700	30,000	.00099	.00017	0.	....	
139,650	35,000	.00118	.00019	0.	....	
159,600	40,000	.00138	.00020	0.	....	
179,550	45,000	.00157	.00019	0.	....	
199,500	50,000	.00178	.00021	0.	....	
203,490	51,000	.00183	.00005	....	....	
207,480	52,000	.00188	.00005	....	....	
211,470	53,000	.00193	.00005	....	....	
215,460	54,000	.00200	.00007	....	....	
219,450	55,000	.00208	.00008	.00005	.00005	
223,440	56,000	.00217	.00009	....	....	
227,430	57,000	.00228	.00011	....	....	
231,420	58,000	.00248	.00020	....	....	
235,410	59,000	.00349	.00101	....	....	
239,400	60.000	.00560	.00211	.00312	.00307	
243,390	61,000	.00680	.00120	....	....	
247,380	62,000	.00850	.00170	....	....	
251,370	63,000	.01015	.00165	....	....	
255,360	64,000	.01145	.00130	....	....	
259,350	65,000	.01400	.00255	.01110	.00798	
263,340	66,000	.015	.001	....	....	
267,330	67,000	.017	.002	....	....	
271,320	68,000	.019	.002	....	....	
275,310	69,000	.021	.002	....	....	
279,300	70,000	.024	.003	....	....	
283,290	71,000	.026	.002	....	....	
287,280	72,000	.029	.003	....	....	
291,270	73,000	.032	.003	....	....	
295,260	74,000	.036	.004	....	....	
299,250	75,000	.039	.003	....	....	
303,240	76,000	.044	.005	....	....	
307,230	77,000	.046	.002	....	....	
311,220	78,000	.056	.010	....	....	
315,210	79,000	.064	.008	....	....	
319,200	80,000	.078	.014	....	....	
323,190	81,000	.100	.022	....	....	
326,000	81,700	....	....	....	....	Tensile strength.
295,000	....	....	....	....	....	Load at time of rupture.

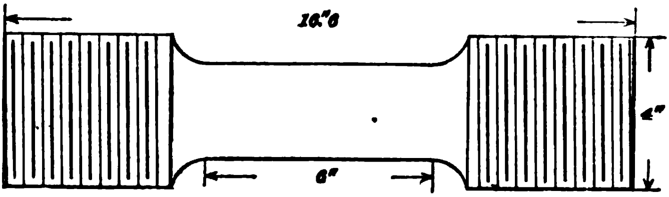
General summary.

Tensile strength per square inch of original section..........pounds..	81,700
Elongation per inch after rupture..........inch..	.207
Reduction in diameter at point of rupture..........do...	.484
Reduction in area after rupture, per cent of original section..........	38.3
Position of rupture..........	3″.9 from neck
Character of broken surface..........	fine granular, radiating from a silky center ″.4 in diameter
Elongation of inch sections..........	″.10, ″.11, ″.12, ″.13, ″.15, ″.16, ″.25, ″.53*, ″.36, ″.16

No. 5762.

SPECIMEN FROM STEEL RAILROAD AXLE.

(See Report 1891, page 297, for other tests of this axle.)



Diameter, 2''.505.

Sectional area, 4.93 square inches.

Loaded by tension with 197,200 pounds = 40,000 pounds per square inch, which elongated the specimen ''.12 in 5 inches.

Also loaded by tension with 246,500 pounds = 50,000 pounds per square inch, which elongated the specimen ''.32 total in 5 inches.

Diameter drawn down to 2''.429 = 4.634 square inches area; hence the stress per square inch on the reduced section was 53,190 pounds.

Tensile test discontinued.

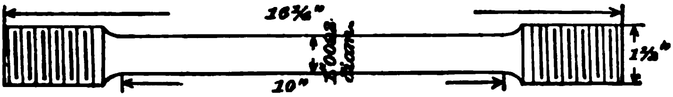
Rested eight days then placed in machine and tested by compression.

Sectional area called 4.93 square inches (original).

Gauged length, 5''.32.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
4,930	1,000	0.	0.	Initial load. Micrometer set at zero.
24,650	5,000	.0004	0.	
49,300	10,000	.0013	0.	
73,950	15,000	.0021	0.	
98,600	20,000	.0030	.0001	
123,250	25,000	.0040	.0001	
147,900	30,000	.0054	.0005	
172,550	35,000	.0078	.0020	
197,200	40,000	.0134	.0064	
221,850	45,000	.0256	.0177	
246,500	50,000	.0584	.0486	
271,150	55,000	.1075	.0970	
295,800	60,000	.1750	.1634	

Turned down to following dimensions:



Rested 17 days then tested by tension.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0014	0.	
8,000	10,000	.0032	0.	
12,000	15,000	.0049	0.	
16,000	20,000	.0065	0.	
20,000	25,000	.0083	0.	
24,000	30,000	.0105	.0005	
28,000	35,000	.0231	.0111	
32,000	40,000	.0449	.0314	
36,000	45,000	.09	....	
40,000	50,000	.14	....	
44,000	55,000	.22	....	
48,000	60,000	.36	....	
50,200	62,750	....	....	Tensile strength.
0	0	.55	....	=5.5 per cent.

Elongation of inch sections: ″.22, ″.08, ″.02, ″.01, ″.01, ″.00, ″.00, ″.01, ″.06, ″.14.

Diameter at fracture, ″.90. Area, .636 square inch.

Contraction of area, 20.5 per cent.

Appearance of fracture, granular; three dull spots near the circumference ″.15 diameter each.

No. 5085.

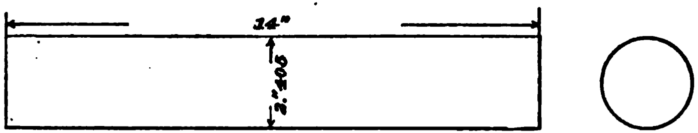
WROUGHT IRON BAR.

Diameter, 2″.82. Sectional area, 6.246 square inches. } Original.
Gauged length, 10″. }
Test resumed after resting without load two years and one month.
(See Report 1890, page 698, for earlier part of this test.)

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
6,246	1,000			—.00041						Micrometer reset to last reading.
62,460	10,000	—.00011	.00030	—.00041	0.					
62,460	10,000					.00079	.00068	.00050	.00009	
124,920	20,000	+.00024	.00103	—.00043	.00007					
124,920	20,000					.00110	.00134	.00049	.00006	
187,380	30,000	.00060	.00170	—.00042	.00007					
187,380	30,000					.00145	.00205	.00050	.00008	
249,840	40,000	.00097	.00242	—.00043	.00007					
249,840	40,000					.00190	.00287	.00057	.00014	
312,300	50,000	.00142	.00332	—.00040	.00007					
312,300	50,000					.00585	.00727	.00408	.00363	Specimen began to buckle.
62,460	10,000	—.00362	.00223	—.00392	.00012					
124,920	20,000	—.00315	.00047	—.00383	.00009					
187,380	30,000	—.00254	.00061	—.00359	.00024					
249,840	40,000	—.00156	.00098	—.00301	.00058					
312,300	50,000	+.00052	.00208	—.00141	.00160					Micrometer removed.
324,792	52,000	.001	.00048							
337,284	54,000	.003	.002							
349,776	56,000	.021	.018							
362,268	58,000	.037	.016							
373,720	59,830									Tensile strength.

After passing the maximum load local contraction went on under diminished total stress.
When the stress had fallen to 350,000 pounds, the test was discontinued.

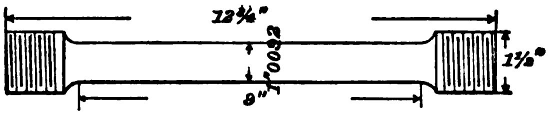
The minimum diameter was 2″4.2 = 4.60 square inches.
Total contraction of area, 26.4 per cent.
The stress per square inch on the reduced section when the test was discontinued was 76,090 pounds.
The stem of the bar was now cut off 14 inches long and turned down to 2″.405 diameter, and tested by compression.



The place of minimum diameter in the previous tension test was midway the length of the compression specimen.
Interval between the tension and the present compression test eight days.
Sectional area, 4.54 square inches.
Gauged length, 10″.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
4,540	1,000	....	....	....	....	0.	0.	0.	0.	Initial load.
22,700	5,000	....	....	....	....	.00012	.00012	0.	....	
45,400	10,000	....	....	....	....	.00025	.00013	.00002	.00002	
68,100	15,000	....	....	....	....	.00042	.00017	.00002	0.	
90,800	20,000	....	....	....	....	.00058	.00016	.00002	0.	
113,500	25,000	....	....	....	....	.00074	.00016	.00003	.00001	
136,200	30,000	....	....	....	....	.00093	.00019	.00004	.00001	
158,900	35,000	....	....	....	....	.00116	.00023	.00009	.00005	
181,600	40,000	....	....	....	....	.00144	.00028	.00019	.00010	
204,300	45,000	....	....	....	....	.00188	.00044	.00041	.00022	
227,000	50,000	....	....	....	....	.00250	.00062	.00083	.00042	
249,700	55,000	....	....	....	....	.00342	.00092	.00151	.00068	
272,400	60,000	....	....	....	....	.00502	.00160	.00286	.00135	
295,100	65,000	....	....	....	....	.00826	.00324	.00581	.00295	
317,800	70,000	....	....	....	....	.01688	.00862	.01415	.00834	
....	....	....	....	....	....	....	....	.01412	—.00003	Set after 5 minutes.

Turned down to tensile specimen.



Sectional area, .80 square inch.
Rested seventeen days and tested by tension.
Gauged length, 9''.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	0.	0.	....	....	....	....	Initial load.
4,000	5,000	.00014	.00014	0.	....	....	....	....	....	
8,000	10,000	.00033	.00019	0.	....	....	....	....	....	
12,000	15,000	.00051	.00018	0.	....	....	....	....	....	
16,000	20,000	.00070	.00019	.00001	.00001	....	....	....	....	
20,000	25,000	.00089	.00019	.00001	0.	....	....	....	....	
24,000	30,000	.00107	.00018	.00002	.00001	....	....	....	....	
28,000	35,000	.00128	.00021	.00006	.00004	....	....	....	....	
32,000	40,000	.00151	.00023	.00011	.00005	....	....	....	....	
58,570	73,210	....	....	....	....	....	....	....	....	Tensile strength.

Elongation in 9 inches, ''.54=6 per cent.
Elongation of inch sections, ''.31*, ''.16, ''.02, ''.00, ''.00, ''.00, ''.02, ''.01, ''.02.
Diameter at fracture, ''.75. Area, .442 square inch.
Contraction of area, 44.8 per cent.
Appearance of fracture, fibrous, seamy, 50 per cent granular.

No. 5763.

COLD ROLLED IRON BAR.

Mark, A.
Diameter, 3″.
Sectional area, 7,068 square inches.
Gauged length, 10″.
Specimens A and B were from the same bar, the diameter of which was $3\frac{3}{4}''$.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0.	0.	0.	0.	0.	0.	0.	0.	
70, 680	10, 000	.00030	.00030	0.						
70, 680	10, 000					.00028	.00058	0.		
141, 360	20, 000	.00066	.00094	0.						
141, 360	20, 000					.00063	.00129	0.		
212, 040	30, 000	.00103	.00166	0.						
212, 040	30, 000					.00102	.00205	0.		
282, 720	40, 000	.00147	.00249	0.						
282, 720	40, 000					00160	.00307	.00020	.00020	
70, 680	10, 000	.00011	.00171	—.00019	.00001					
70, 680	10, 000					.00052	.00063	.00022	.00003	
141, 360	20, 000	.00045	.00097	—.00019	.00003					
141, 360	20, 000					.00084	.00129	.00022	.00003	
212, 040	30, 000	.00085	.00169	—.00018	.00004					
212, 040	30, 000					.00120	.00205	.00019	.00001	
282, 720	40, 000	.00132	.00252	—.00014	.00005					
282, 720	40, 000					.00163	.00295	.00023	.00009	

Removed from testing machine.

Gauged length now measures 9''.9975 when referred to standard bar.

Stem turned down to 2''.522 diameter, 9''.12 long, after which the gauged length measured 9''.9958; indicating a shortening of ''.0017 in a length of 9''.12. The compression stress corresponding to this strain is 5,470 pounds per square inch.

Sectional area, 5 square inches. Gauged length, 9''.

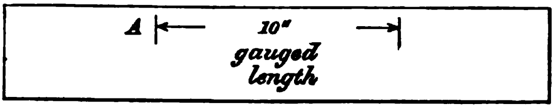
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0.	0.	0.	0.	
200,000	40,000	.001	.001			
225,000	45,000	.001+	.0000+			
250,000	50,000	.002	.001			
260,000	52,000	.006	.004			
265,000	53,000	.007	.001			
270,000	54,000	.017	.010			
275,000	55,000	.024	.007			
280,000	56,000	.033	.009			
285,000	57,000	.043	.010			
290,000	58,000	.063	.020			
291,060	58,210					Tensile strength.
259,800						Load at time of rupture.

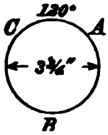
General summary.

Tensile strength per square inch of original section	pounds..	58,210
Elongation per inch after rupture	inch..	.143
Reduction in diameter at point of rupture	do...	.402
Reduction in area after rupture, per cent of original section		29.4
Character of broken surface		granular, 60 per cent; fibrous, 40 per cent
Elongation of inch sections		''.04, ''.06, ''.10, ''.15, ''.21, ''.45*, ''.15, ''.09, ''.04

NOTE.—The age of this cold-rolled metal was not definitely known. It was, however, more than sixteen months old at the time of making the tests.

Before turning down into the form of specimen for alternate stresses the internal strains in specimen A were investigated as follows:

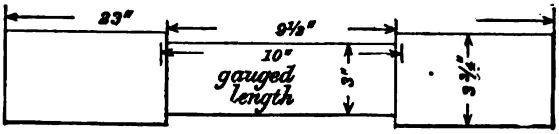




Three gauged lengths 120° apart, laid off on bar, and measured as follows:

A	B	C
Inches.	*Inches.*	*Inches.*
10.0042	10.0010	10.0028

The bar was now turned down to 3" diameter, a length of 9½" symmetrical with the gauged lengths, and measurements again taken as follows:



A	B	C
Inches.	*Inches.*	*Inches.*
10.0005	9.9978	9.9998

The bar therefore shortened along the gauged lengths.

A	B	C
Inch.	*Inch.*	*Inch.*
.0037	.0032	.0030

Mean contraction, ".0033.

As this contraction occurred in the length 9½" where the bar was turned down in diameter, the corresponding mean compressive stress, assuming a modulus of elasticity of 27,000,000 pounds per square inch, was 9,379 pounds per square inch.

The sectional area of the annular ring of metal cut away being (11.0447–7.0686) 3.9761 square inches, this compressive stress represents the gross load, 37,290 pounds.

No. 5764.

COLD ROLLED IRON BAR.

Mark, B.
Diameter, 3″.
Sectional area, 7.068 square inches.
Gauged length, 10″.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0.	0.	0.	0.	0.	0.	0.	0.	
70, 680	10, 000	.00035	.00035	0.						
70, 680	10, 000					.00035	.00070	—.00001	—.00001	
141, 860	20, 000	.00070	.00105	.00001	0.					
141, 360	20, 000					.00066	.00136	—.00003	—.00002	
212, 040	30, 000	.00108	.00174	.00003	0.					
212, 040	30, 000					.00106	.00214	+.00001	.00004	
282, 720	40, 000	.00155	.00261	.00005	.00006					
282, 720	40, 000					.00166	.00321	.00021	.00026	
282, 720	40, 000	.00137	.00303	—.00012	.00009					
282, 720	40, 000					.00167	.00304	.00022	.00010	
70, 680	10, 000	.00013	.00180	—.00021	.00001					
70, 680	10, 000					.00059	.00072	.00021	0.	
141, 360	20, 000	.00050	.00109	—.00021	0.					
141, 360	20, 000					.00092	.00142	.00021	0.	
212, 040	30, 000	.00089	.00181	—.00020	.00001					
212, 040	30, 000					.00126	.00215	.00021	.00001	
818, 060	45, 000	.00176	.00302	+.00002	.00023					
853, 400	50, 000	.00360	.00184	.00153	.00151					
70, 680	10. 000	.00189	—.00171	.00153	0.					
70, 680	10, 000					—.00117	.00072	—.00152	.00001	
141, 360	20, 000	.00224	.00107	.00152	0.					
141, 360	20, 000					—.00077	.00147	—.00145	.00007	
212, 040	30, 000	.00259	.00182	.00147	.00002					
212, 040	30, 000					—.00025	.00234	—.00131	.00016	
282, 720	40. 000	.00295	.00270	.00141	.00010					
282, 720	40, 000					+.00064	.00359	—.00084	.00057	
282, 720	40, 000	.00267	.00331	.00110	.00026					

Bar removed from machine.

Gauged length now measures 10″.0165 when referred to the standard bar.

Stem turned down to 2″.520 diameter by 9″.16 long.

Gauged length after turning down stem 10″.0150, indicating a shortening of ″.0015 in 9″.16.

The bar was heated full cherry red and cooled in the open air; one end reached a higher temperature, a bright red.

Again placed in the testing machine and test completed by tension.

Diameter, 2″.520.

Sectional area, 4.98 square inches. Gauged length, 9″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
4,980	1,000	0.	0.	0.	0.	Micrometer adjusted to zero.
49,800	10,000	.000389	.000389	.000044	.000044	
99,600	20,000	.000822	.000433	.000078	.000034	
119,520	24,000	....	....	....	....	Elastic limit. Approximate.
124,500	25,000	.002679	.001857	.001745	.001667	
129,480	26,000	.004400	.001721	....	....	
134,460	27,000	.006056	.001656	....	....	
139,440	28,000	.008833	.002777	....	....	
144,420	29,000	.011500	.002667	....	....	
149,400	30,000	.014356	.002856	.013111	.011366	
159,360	32,000	.0211	.006744	....	....	
169,320	34,000	.0300	.0089	....	....	
179,280	36,000	.0379	.0079	....	....	
189,240	38,000	.0511	.0132	....	....	
199,200	40,000	.0678	.0167	....	....	
209,160	42,000	.0878	.0200	....	....	
219,120	44,000	.1333	.0455	....	....	
224,950	45,170	.2144	.0811	....	....	Tensile strength.

Immediately after reaching the tensile strength there was a brief interruption in the progress of stretching to allow an opportunity to measure the total stretch of the bar at that time.

Upon resuming the test it was found that 224,950 pounds total load, which in the first instance was causing continuous stretching, did not now cause any further elongation.

The load was gradually increased to 227,500 pounds when rapid stretching was again resumed. The load then began to fall slowly as stretching proceeded, and the test was again discontinued when the load had fallen to 225,000 pounds—the total elongation at the time being 2″.13.

A rest of fifteen hours without load was given the bar for the purpose of ascertaining the effect of this additional rest upon the tensile resistance.

Under earlier stresses, but after the bar had received a considerable permanent set, the metal was observed to possess a decided tendency to display periods of rigidity under increased stresses if the stretching was not continuous.

After a rest of fifteen hours without load the test was resumed.

The tensile stress was increased to 253,700 pounds before rapid stretching was renewed.

The stress slowly fell to 250,000 pounds when the total stretch had reached 2″.15 in 9 inches. Then the load was released and the bar taken from the testing machine.

Test resumed after resting forty-two days.

Tensile strength 260,100 pounds=52,230 pounds per square inch on the original section.

Total elongation in 9 inches 2″.55=28.3 per cent.

Diameter at fracture, 2″.03. Area, 3.24 square inches.

Contraction of-area, 34.9 per cent.

Appearance of fracture, granular 60 per cent; fibrous center 40 per cent.

No. 5088.

CAST IRON BAR.

Marks, 1*b*.
Diameter, 3″. Sectional area, 7.068 square inches. } Original.
Gauged length, 10″. }
Test resumed after a rest of seventeen months.
(See Report 1890, p. 708, for earlier part of this test.)

[This and succeeding cast iron specimens, excepting sand casting No. 2770, were all from the same casting.]

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0			—.01235						Micrometer adjusted to last reading preceding the period of rest.
35,340	5,000	—.01205	.00030	—.01228	.00007					
70,680	10,000	—.01147	.00058	—.01198	.00030					
106,020	15,000	—.01053	.00094	—.01135	.00063					
141,360	20,000	—.00910	.00143	—.01030	.00105					
176,700	25,000	—.00703	.00207	—.00868	.00162					
35,340	5,000					.00900	.00197	.00872	.00004	
70,680	10,000					.00937	.00037	.00882	.00010	
106,020	15,000					.00992	.00055	.00901	.00019	
141,360	20,000					.01040	.00048	.00920	.00019	
176,700	25,000					.01081	.00041	.00942	.00022	
212,040	30,000					.01129	.00048	.00962	.00020	
247,380	35,000					.01180	.00051	.00987	.00025	
282,720	40,000					.01240	.00060	.01023	.00036	
35,340	5,000	—.00984	.00256	—.01010	.00013					
76,680	10,000	—.00938	.00046	—.00994	.00016					
106,020	15,000	—.00885	.00053	—.00970	.00024					
141,360	20,000	—.00810	.00075	—.00930	.00040					
176,700	25,000	—.00701	.00109	—.00859	.00071					
35,340	5,000					.00806	.00195	.00870	.00011	
141,360	20,000					.01018	.00122	.00908	.00038	
282,720	40,000					.01229	.00211	.01010	.00102	

Bar removed from testing machine and annealed between hot plates.
Expansion ".0613 in length of 9".9.
Estimated temperature, 1,124° F.
Bar rested eight days after annealing, test then resumed.

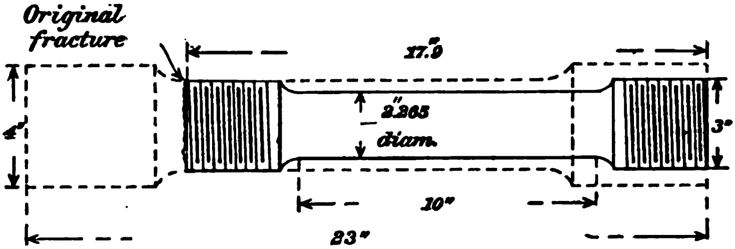
0	0	......	......	—.01010	......	......	......	......	......	Micrometer set to last reading preceding the annealing.
35,340	5,000	—.00984	.00026	—.01010	0.	......	......	......	......	
70,680	10,000	—.00952	.00032	—.01008	.00002	......	......	......	......	
106,020	15,000	—.00916	.00036	—.01003	.00005	......	......	......	......	
141,360	20,000	—.00865	.00051	—.00986	.00017	......	......	......	......	
176,700	25,000	—.00786	.00079	—.00942	.00044	......	......	......	......	
35,340	5,000	......	......	......	......	.00972	.00186	.00948	.00006	
70,680	10.000	......	......	......	......	.01010	.00038	.00957	.00009	
106,020	15,000	......	......	......	......	.01048	.00038	.00970	.00013	
141,360	20,000	......	......	......	......	.01090	.00042	.00982	.00012	
176,700	25,000	......	......	......	......	.01125	.00035	.00994	.00012	
212,040	30,000	......	......	......	......	.01159	.00034	.01004	.00010	
247,380	35 000	......	......	......	......	.01194	.00035	.01015	.00011	
282,720	40,000	......	......	......	......	.01233	.00039	.01027	.00012	
35,340	5,000	—.00986	.00247	—.01015	.00012	......	......	......	......	
70,680	10,000	—.00946	.00040	—.01005	.00010	......	......	......	......	
106 020	15,000	—.00901	.00045	—.00992	.00013	......	......	......	......	
141,360	20,000	—.00857	.00044	—.00970	.00022	......	......	......	......	
176,700	25,000	—.00791	.00066	—.00937	.00033	......	......	......	......	
179,880	25,450	......	......	......	......	......	......	......	......	Tensile strength.

Fractured at the neck.

Appearance of fracture, uniform granular, except at the circumference there were dark colored spots extending ″.05 to ″.08 toward the center of the bar.

The cause of these dark colored spots is unknown, but their presence may be due to cracks which existed before annealing, and were discolored at that time.

Fractured end turned down to a smaller specimen and again tested by tension.



Sectional area, 4.03 square inches.

Tensile strength, 116,560 pounds = 28,920 pounds per square inch.

Fractured 9¾″ from original fracture, or 4¼″ from neck of present specimen.

Appearance of fracture, uniform granular.

No. 5510.

CAST IRON BAR.

Marks, M I, one end. B II, one end.
Diameter, 2″.500. Sectional area, 4.91 square inches.
Gauged length, 10″.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0.	0.	0.	0.	....	....	....	....	
24,550	5,000	.00027	.00027	—.00002	—.00002	....	....	....	....	
49,100	10,000	.00053	.00026	—.00002	0.	....	....	....	....	
73,650	15,000	.00086	.00033	+.00004	+.00006	....	....	....	....	
98,200	20,000	.00128	.00042	+.00022	.00018	....	....	....	....	
122,750	25,000	.00207	.00079	.00061	.00039	....	....	....	....	
24,550	5,000	....	....	....	....	—.00032	.00175	—.00051	.00010	
49,100	10,000	....	....	....	....	+.00005	.00037	—.00036	.00015	
73,650	15,000	....	....	....	....	+.00041	.00036	—.00023	.00013	
98,200	20,000	....	....	....	....	.00084	.00043	—.00006	.00017	
122,750	25,000	....	....	....	....	.00127	.00043	+.00010	.00016	
24,550	5,000	.00027	.00154	—.00002	.00008	....	....	....	....	
49,100	10,000	.00060	.00033	+.00004	.00006	....	....	....	....	
73,650	15,000	.00100	.00040	.00014	.00010	....	....	....	....	
98,200	20,000	.00146	.00046	.00031	.00017	....	....	....	....	
122,750	25,000	.00208	.00062	.00060	.00029	....	....	....	....	
24,550	5,000	....	....	....	....	—.00028	.00180	—.00047	.00013	
49,100	10,000	....	....	....	....	+.00007	.00035	—.00037	.00010	
73,650	15,000	....	....	....	....	+.00047	.00040	—.00021	.00016	
98,200	20,000	....	....	....	....	.00086	.00039	—.00008	.00013	
122,750	25,000	....	....	....	....	.00129	.00043	+.00011	.00019	
147,300	30,000	....	....	....	....	.00178	.00049	.00036	.00025	
171,850	35,000	....	....	....	....	.00257	.00079	.00088	.00052	
196,400	40,000	....	....	....	....	.00417	.00160	.00214	.00126	
24,550	5,000	—.00167	.00250	—.00194	.00020	....	....	....	....	
49,100	10,000	—.00117	.00050	—.00172	.00022	....	....	....	....	

No. 5510—Continued.

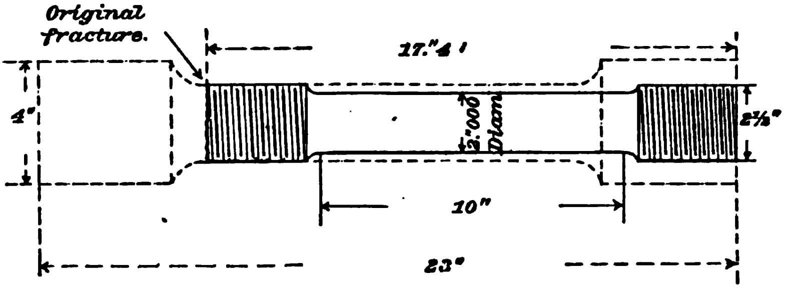
Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
73, 650	15, 000	—. 00050	. 00067	—. 00134	. 00038	....	....	....	....	
98. 200	20, 000	+. 00039	. 00089	±. 00078	. 00056	....	....	....	....	
122, 750	25, 000	. 00158	. 00119	+. 00006	. 00084	....	....	....	....	
24, 550	5, 000	....	....	....	....	. 00030	. 00188	. 00003	. 00009	
49, 100	10, 000	....	....	....	....	. 00067	. 00037	. 00017	. 00014	
73, 650	15, 000	....	....	....	....	. 00114	. 00047	. 00038	. 00021	
98, 200	20, 000	....	....	....	....	. 00162	. 00048	. 00061	. 00023	
122, 750	25, 000	....	....	....	....	. 00212	. 00050	. 00086	. 00025	
147, 300	30, 000	....	....	....	....	. 00237	. 00025	. 00114	. 00028	
171, 850	35, 000	....	....	....	....	. 00327	. 00090	. 00154	. 00040	
196, 400	40. 000	....	....	....	....	. 00426	. 00099	. 00222	. 00068	
220, 950	45, 000	....	....	....	....	. 00676	. 00250	. 00435	. 00213	
245, 500	50, 000	....	....	....	....	. 00981	. 00305	. 00712	. 00277	
24, 550	5, 000	—. 00656	. 00325	—. 00681	. 00031	....	....	....	....	
49, 100	10, 000	—. 00597	. 00059	—. 00648	. 00033	....	....	....	....	
73, 650	15, 000	—. 00510	. 00087	—. 00590	. 00058	....	....	....	....	
98. 200	20, 000	—. 00382	. 00128	—. 00498	. 00092	....	....	....	....	
122, 750	25, 000	—. 00204	. 00178	—. 00355	. 00143	....	....	....	....	
24, 550	5, 000	....	....	....	....	. 00386	. 00182	. 00359	. 00004	Rested 16 hours.
49, 100	10, 000	....	....	....	....	. 00425	. 00039	. 00372	. 00013	
73, 650	15, 000	....	....	....	....	. 00470	. 00045	. 00387	. 00015	
98, 200	20, 000	....	....	....	....	. 00515	. 00045	. 00407	. 00020	
122, 750	25, 000	....	....	....	....	. 00565	. 00050	. 00432	. 00025	
147, 300	30, 000	....	....	....	....	. 00615	. 00050	. 00459	. 00027	
171, 850	35, 000	....	....	....	....	. 00675	. 00060	. 00493	. 00034	
196, 400	40, 000	....	....	....	....	. 00745	. 00070	. 00537	. 00044	
220, 950	45, 000	....	....	....	....	. 00834	. 00089	. 00598	. 00061	
245, 500	50, 000	....	....	....	....	. 00974	. 00140	. 00704	. 00106	
270, 050	55, 000	....	....	....	....	. 01314	. 00340	. 01005	. 00301	
294, 600	60, 000	....	....	....	....	. 01762	. 00448	. 01411	. 00406	
24, 550	5. 000	—. 01353	. 00409	—. 01378	. 00033	....	....	....	....	
49, 100	10, 000	—. 01285	. 00068	—. 01336	. 00042	....	....	....	....	
73, 650	15, 000	—. 01190	. 00095	—. 01270	. 00066	....	....	....	....	
98, 200	20, 000	—. 01049	. 00141	—. 01165	. 00105	....	....	....	....	
122, 750	25, 000	—. 00856	. 00194	—. 01005	. 00160	....	....	....	....	

24,550	5,000	....	....	....	....	.01042	.00187	.01013	.00008	
49,100	10,000	....	....	....	....	.01077	.00035	.01024	.00011	
73,650	15,000	....	....	....	....	.01117	.00040	.01034	.00010	
98,200	20,000	....	....	....	....	.01159	.00042	.01030	.00016	
122,750	25,000	....	....	....	....	.01204	.00045	.01067	.00017	
147,300	30,000	....	....	....	....	.01248	.00044	.01087	.00020	
171,850	35,000	....	....	....	....	.01297	.00049	.01110	.00023	
196,400	40,000	....	....	....	....	.01352	.00055	.01139	.00029	
220,950	45,000	....	....	....	....	.01417	.00065	.01176	.00037	
245,500	50,000	....	....	....	....	.01491	.00074	.01221	.00045	
270,050	55,000	....	....	....	....	.01590	.00099	.01288	.00067	
294,600	60,000	....	....	....	....	.01744	.00154	.01404	.00116	
319,150	65,000	....	....	....	....	.02215	.00471	.01834	.00430	
343,700	70,000	....	....	....	....	.03117	.00902	.02585	.00751	Bar deflected convex on the micrometer side.
24,550	5,000	—.02532	.00585	—.02557	.00028	....	....	....	....	
49,100	10,000	—.02451	.00081	—.02502	.00055	....	....	....	....	
73,650	15,000	—.02350	.00101	—.02432	.00070	....	....	....	....	
98,200	20,000	—.02209	.00141	—.02324	.00108	....	....	....	....	
111,080	22,620	....	....	....	....	....	....	....	....	Tensile strength.

Fractured at the neck. Appearance, uniform granular.

Minute cracks developed, visible on the surface of the stem, taking irregular zigzag directions.

Fractured end turned down to a smaller specimen and again tested by tension.



Sectional area, 3.14 square inches.

Tensile strength, 86,980 pounds = 27,700 pounds per square inch.

Fractured 6½" from original fracture, or 2¾" from neck of present specimen.

The present fracture occurred 1" inside the neck on the original specimen.

Appearance of fracture, uniform granular.

No. 5515.

CAST IRON BAR.

Marks, $\frac{B_{11-3}}{M_{11-3}}$
Diameter, 2″.500.
Sectional area, 4.91 square inches.
Gauged length, 10″.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0.	0.	0.	0.	0.	0.	0.	0.	
24, 550	5, 000	.00025	.00025	—.00003	—.00003					
49, 100	10, 000	.00054	.00029	—.00002	+.00001					
73, 650	15, 000	.00085	.00031	+.00003	.00001					
98, 200	20, 000	.00128	.00043	.00015	.00012					
122, 750	25, 000	.00207	.00079	.00058	.00043					
24, 550	5, 000					—.00031	.00176	—.00050	.00008	
49, 100	10, 000					+.00005	.00036	—.00036	.00014	
73, 650	15, 000					.00042	.00037	—.00024	.00012	
98, 200	20, 000					.00080	.00038	—.00010	.00014	
122, 750	25, 000					.00121	.00041	+.00007	.00017	
24, 550	5, 000	.00027	.00148	0.	.00007					
49, 100	10, 000	.00061	.00034	.00007	.00007					
73, 650	15, 000	.00100	.00039	.00017	.00010					
98, 200	20, 000	.00148	.00048	.00032	.00015					
122, 750	25, 000	.00210	.00062	.00059	.00027					
122, 750	25, 000					.00120	.00030	.00003	.00062	
24, 550	5, 000	.00030		.00002	.00005					
49, 100	10, 000	.00065	.00035	.00010	.00008					
73, 650	12, 000	.00103	.00038	.00019	.00009					
98, 200	20, 000	.00150	.00047	.00035	.00016					
122, 750	25, 000	.00210	.00060	.00059	.00024					

Loaded with 25,000 pounds per square inch compressive stress five times, alternately with the same tensile stress, the tensile stress being applied four times, the last loading being in the compression direction.

No. 5515—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
122,750	25,000	....	....	....	....	....	....	—.00001	.00058	
24,550	5,000	.00036	.00035	.00008	.00007	....	....	....	....	
49,100	10,000	.00071	.00036	.00015	.00007	....	....	....	....	
73,650	15,000	.00110	.00039	.00025	.00010	....	....	....	....	
98,200	20,000	.00155	.00045	.00039	.00014	....	....	....	....	
122,750	25,000	.00213	.00058	.00061	.00022	....	....	....	....	
Alternate loads, 25,000 pounds per square inch each, applied four times by tension, five times by compression.										
122,750	25,000	....	....	....	....	.00116	.00329	—.00003	.00058	
24,550	5,000	.00038	.00154	.00010	.00007	....	....	....	....	
49,100	10,000	.00073	.00035	.00018	.00008	....	....	....	....	
73,650	15,000	.00111	.00038	.00025	.00007	....	....	....	....	
98,200	20,000	.00159	.00048	.00040	.00015	....	....	....	....	
122,750	25,000	.00215	.00056	.00062	.00022	....	....	....	....	
24,550	5,000	....	....	....	....	—.00033	.00182	—.00054	.00008	
49,100	10,000	....	....	....	....	+.00002	.00035	—.00043	.00011	
73,650	15,000	....	....	....	....	.00041	.00039	—.00030	.00013	
98,200	20,000	....	....	....	....	.00079	.00038	—.00018	.00012	
122,750	25,000	....	....	....	....	.00115	.00036	—.00003	.00015	
24,550	5,000	....	....	....	....	.00015	—.00100	—.00003	0.	
49,100	10,000	....	....	....	....	.00040	+.00025	—.00004	—.00001	
73,650	15,000	....	....	....	....	.00065	.00025	—.00004	0.	
98,200	20,000	....	....	....	....	.00090	.00025	—.00004	0.	
122,750	25,000	....	....	....	....	.00117	.00027	—.00002	+.00002	
24,550	5,000	.00032	.00149	.00007	.00005	....	....	....	....	
49,100	10,000	.00070	.00038	.00014	.00007	....	....	....	....	
73,650	15,000	.00110	.00040	.00025	.00011	....	....	....	....	
98,200	20,000	.00159	.00049	.00041	.00016	....	....	....	....	
122,750	25,000	.00218	.00059	.00063	.00022	....	....	....	....	
24,550	5,000	.00093	—.00125	.00063	0.	....	....	....	....	
98,200	10,000	.00122	+.00029	.00064	.00001	....	....	....	....	
73,650	15,000	.00151	.00029	.00064	0.	....	....	....	....	
98,200	20,000	.00183	.00032	.00063	—.00001	....	....	....	....	
122,750	25,000	.00221	.00038	.00068	+.00005	....	....	....	....	
122,750	25,000	....	....	....	....	.00116	.00337	....	....	

147,300	30,000	....	....	....	....	.00161	.00045	.00015	.00083	
171,850	35,000	....	....	....	....	.00236	.00075	.00060	.00045	
196,400	40,000	....	....	....	....	.00392	.00156	.00182	.00122	
220,950	45,000	....	....	....	....	.00635	.00243	.00382	.00200	
245,500	50,000	....	....	....	....	.00980	.00345	.00696	.00314	Surface slightly roughened.
24,550	5,000	—.00650	.00	—.00672	.00024	....	....	....	....	
49,100	10,000	—.00588	.00062	—.00638	.00034	....	....	....	....	
73,650	15,000	—.00503	.00085	—.00586	.00052	....	....	....	....	
98,200	20,000	—.00378	.00125	—.00495	.00091	....	....	....	....	
122,750	25,000	—.00204	.00174	—.00358	.00137	....	....	....	....	
24,550	5,000	—.00331	—.00127	....	....	....	....	....	....	
49,100	10,000	—.00300	+.00031	....	....	....	....	....	....	
73,650	15,000	—.00270	.00030	....	....	....	....	....	....	
98,200	20,000	—.00240	.00030	....	....	....	....	....	....	
73,650	15,000	—.00267	—.00027	....	....	....	....	....	....	
49,100	10,000	—.00295	—.00028	....	....	....	....	....	....	
24,550	5,000	—.00327	—.00032	—.00358	0.	....	....	....	....	
....	....	....	....	—.00354	.00004	....	....	....	....	Rested 14 hours without load.
24,550	5,000	—.00327	0.	—.00354	0.	....	....	....	....	
49,100	10,000	—.00298	+.00029	—.00354	0.	....	....	....	....	
73,650	15,000	—.00269	.00029	....	....	....	....	....	....	
98,200	20,000	—.00237	.00032	....	....	....	....	....	....	
73,650	15,000	—.00263	—.00026	....	....	....	....	....	....	
49,100	10,000	—.00294	—.00031	....	....	....	....	....	....	
24,550	5,000	—.00324	—.00030	—.00354	0.	....	....	....	....	
147,700	30,080	....	....	....	....	....	....	....	....	Tensile strength.

No. 5516.

CAST IRON BAR.

Marks, $\frac{\text{IIB}}{2}$
Diameter 2''.500. Sectional area, 4.91 square inches.
Gauged length, 10''.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0.	0.	0.	0.	0.	0.	0.	0.	
24,500	5,000	....	....	....	....	.00017	.00017	.00001	.00001	
49,100	10,000	....	....	....	....	.00044	.00027	.00005	.00004	
73,650	15,000	....	....	....	....	.00069	.00025	.00008	.00003	
98,200	20,000	....	....	....	....	.00099	.00030	.00012	.00004	
122,750	25,000	....	....	....	....	.00137	.00038	.00019	.00007	
147,300	30,000	....	....	....	....	.00183	.00046	.00035	.00016	
171,850	35,000	....	....	....	....	.00256	.00073	.00080	.00045	
196,400	40,000	....	....	....	....	.00425	.00169	.00215	.00135	
24,500	5,000	....	....	....	....	.00238	—.00187	....	....	
49,100	10,000	....	....	....	....	.00260	+.00022	....	....	
73,650	15,000	....	....	....	....	.00283	.00023	....	....	
98,200	20,000	....	....	....	....	.00307	.00024	....	....	
122,750	25,000	....	....	....	....	.00331	.00024	....	....	
147,300	30,000	....	....	....	....	.00358	.00027	....	....	
171,850	35,000	....	....	....	....	.00387	.00029	....	....	
147,300	30,000	....	....	....	....	.00364	—.00023	....	....	
122,750	25,000	....	....	....	....	.00341	—.00023	....	....	
98,200	20,000	....	....	....	....	.00318	—.00023	....	....	
73,650	15,000	....	....	....	....	.00295	—.00023	....	....	
49,100	10,000	....	....	....	....	.00271	—.00024	....	....	
24,500	5,000	....	....	....	....	.00245	—.00026	.00215	0.	
24,500	5,000	—.00176	.00069	—.00201	.00014	....	....	....	....	
49,100	10,000	—.00128	.00048	—.00179	.00022	....	....	....	....	
73,650	15,000	—.00063	.00065	—.00143	.00036	....	....	....	....	
98,200	20,000	+.00021	.00084	—.00091	.00052	....	....	....	....	
24,500	5,000	....	....	....	....	.00120	.00141	.00097	.00006	
49,100	10,000	....	....	....	....	.00154	.00034	.00103	.00006	

73,650	15,000	....	....	....	....	.00188	.00034	.00111	.00008	
98,200	20,000	....	....	....	....	.00223	.00035	.00123	.00012	
122,750	25,000	....	....	....	....	.00260	.00037	.00136	.00013	
147,300	30,000	....	....	....	....	.00302	.00042	.00152	.00016	
171,850	35,000	....	....	....	....	.00353	.00051	.00176	.00024	
196,400	40,000	....	....	....	....	.00430	.00077	.00222	.00046	
24,500	5,000	—.00184	.00246	—.00208	.00014	....	....	....	....	
49,100	10,000	—.00138	.00046	—.00189	.00019	....	....	....	....	
73,650	15,000	—.00078	.00060	—.00158	.00031	....	....	....	....	
98,200	20,000	+.00001	.00079	—.00111	.00047	....	....	....	....	
220,950	45,000	....	....	....	....	.00648	.00649	.00413	.00302	
245,500	50,000	....	....	....	....	.00993	.00345	.00713	.00300	
270,050	55,000	....	....	....	....	.01396	.00403	.01074	.00361	**Surface slightly roughened.**
294,600	60,000	....	....	....	....	.01808	.00412	.01454	.00380	
24,500	5,000	....	....	....	....	.01473	—.00335	....	....	
49,100	10,000	....	....	....	....	.01496	+.00023	....	....	
73,650	15,000	....	....	....	....	.01519	.00023	....	....	
98,200	20,000	....	....	....	....	.01543	.00024	....	....	
122,750	25,000	....	....	....	....	.01568	.00025	....	....	
147,300	30,000	....	....	....	....	.01593	.00025	....	....	
171,850	35,000	....	....	....	....	.01621	.00028	....	....	
196,400	40,000	....	....	....	....	.01651	.00030	....	....	
220,950	45,000	....	....	....	....	.01686	.00035	....	....	
245,500	50,000	....	....	....	....	01717	.00031	....	....	
270,050	55,000	....	....	....	....	.01757	.00040	....	....	
245,500	50,000	....	....	....	....	.01735	—.00022	....	....	
220,950	45,000	....	....	....	....	.01708	—.00027	....	....	
196,400	40,000	....	....	....	....	.01685	—.00023	....	....	
171,850	35,000	....	....	....	....	.01660	—.00025	....	....	
147,300	30,000	....	....	....	....	.01634	—.00026	....	....	
122,750	25,000	....	....	....	....	.01608	—.00026	....	....	
98,200	20,000	....	....	....	....	.01582	—.00026	....	....	
73,650	15,000	....	....	....	....	.01554	—.00028	....	....	
49,100	10,000	....	....	....	....	.01526	—.00028	....	....	
24,500	5,000	....	....	....	....	.01495	—.00031	.01458	.00004	
24,500	5,000	—.01409	.00086	—.01431	.00027	....	....	....	....	
49,100	10,000	—.01336	.00073	—.01386	.00045	....	....	....	....	
73,650	15,000	—.01241	.00095	—.01318	.00068	....	....	....	....	
98,200	20,000	—.01098	.00143	—.01210	.00108	....	....	....	....	
24,500	5,000	....	....	....	....	.01243	.00145	.01216	.00006	
49,100	10,000	....	....	....	....	.01273	.00030	.01210	.00003	
73,650	15,000	....	....	....	....	.01305	.00032	.01222	.00003	
98,200	20,000	....	....	....	....	.01333	.00028	.01230	.00008	
122,750	25,000	....	....	....	....	.01367	.00034	.01240	.00010	
147,300	30,000	....	....	....	....	.01401	.00034	.01247	.00007	
171,850	35,000	....	....	....	....	.01441	.00040	.01259	.00012	
196,400	40,000	....	....	....	....	.01487	.00046	.01276	.00017	

No. 5516—Continued.

Applied loads.		Under tensile stress.				Under compressive stress.				Remarks.
		Elongation per inch.		Permanent set per inch.		Compression per inch.		Permanent set per inch.		
Total.	Per square inch.	Total.	Successive.	Total.	Successive.	Total.	Successive.	Total.	Successive.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
24, 550	5, 000	—. 01243	. 00244	—. 01268	. 00008					
49, 100	10, 000	—. 01206	. 00037	—. 01256	. 00012					
73, 650	15, 000	—. 01158	. 00048	—. 01238	. 00018					
98, 200	20, 000	—. 01095	. 00063	—. 01204	. 00034					
145, 600	29, 650									Tensile strength.

Fractured at the neck. Appearance, uniform granular.

No. 5758.

Cast Iron Bar.

Marks, OOB_1.
Diameter, 3″.
Sectional area, 7.068 square inches.
Tensile strength, 203,900 pounds = 28.840 pounds per square inch.
Fractured at root of thread, which was 3″.65 diameter = 10.46 square inches area.
Tensile strength per square inch at root of thread 19,490 pounds.
Appearance of fracture, granular, mottled.

No. 5759.

Cast Iron Bar.

Marks, 11 M 6.
Diameter, 3″.
Sectional area, 7.068 square inches.
Tensile strength, 205,700 pounds = 29,100 per square inch.
Fractured at the neck. Appearance, granular, mottled.

No. 5760.

Cast Iron Bar.

Marks, $^{B\,I\,I}_{\;\;4}$
Diameter, 3″.
Sectional area, 7.068 square inches.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
7, 068	1, 000	0.	0.	0.	0.	Initial load.
14, 136	2, 000	.00007	.00007	....	....	
21, 204	3, 000	.00012	.00005	....	....	
28, 272	4, 000	.00016	.00004	....	....	
35, 340	5, 000	.00022	.00006	.00002	.00002	
42, 408	6, 000	.00028	.00006	....	....	
49, 476	7, 000	.00033	.00005	....	....	
56, 544	8, 000	.00038	.00005	....	....	
63, 612	9, 000	.00043	.00005	....	....	
70, 680	10, 000	.00048	.00005	.00005	.00003	
77, 748	11, 000	.00054	.00006	....	....	
84, 816	12, 000	.00060	.00006	....	....	
91, 884	13, 000	.00068	.00008	....	....	
98, 952	14, 000	.00073	.00005	.00008	.00003	
106, 020	15, 000	.00081	.00008	....	....	
113, 088	16, 000	.00088	.00007	.00013	.00005	
120, 156	17, 000	.00095	.00007	....	....	
127, 224	18, 000	.00103	.00008	.00015	.00002	
134, 292	19, 000	.00113	.00010	....	....	
141, 360	20, 000	.00123	.00010	.00021	.00006	
148, 428	21, 000	.00133	.00010	....	....	
155, 496	22, 000	.00147	.00014	.00031	.00010	
162, 564	23, 000	.00161	.00014	....	....	
169, 632	24, 000	.00179	.00018	.00048	.00017	
176, 700	25, 000	.00200	.00021	.00062	.00014	
212, 700	30, 090	....	....	....	....	Tensile strength.

Fractured 1″.4 from neck. Appearance, granular, mottled.

No. 5761.

CAST IRON BAR.

Marks, 11 B 6.
Diameter, 3″.
Sectional area, 7.068 square inches.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
7,068	1,000	0.	0.	0.	0.	Initial load.
14,136	2,000	.00007	.00007	....	....	
21,204	3,000	.00012	.00005	....	....	
28,272	4,000	.00016	.00004	....	....	
35,340	5.000	.00022	.00006	.00001	.00001	
42.408	6,000	.00027	.00005	....	....	
49,476	7,000	.00033	.00006	....	....	
56,544	8,000	.00037	.00004	....	....	
63,612	9,000	.00043	.00006	....	....	
70,680	10,000	.00050	.00007	.00004	.00003	
77,748	11,000	.00055	.00005	....	....	
84,816	12,000	.00061	.00006	....	....	
91,884	13,000	.00067	.00006	....	....	
98,952	14,000	.00074	.00007	....	....	
106,020	15,000	.00080	.00006	.00007	.00003	
113.088	16,000	.00089	.00009	.00010	.00003	
120,156	17,000	.00096	.00007	....	....	
127,224	18.000	.00105	,00009	.00013	.00003	
134,292	19,000	.00114	.00009	....	....	
141,360	20,000	.00125	.00011	.00020	.00007	
148,428	21,000	.00135	.00010	....	....	
155.496	22,000	.00148	,00013	.00029	.00009	
162.564	23,000	.00164	.00016	....	....	
169,632	24,000	.00184	.00020	.00047	.00018	
176,700	25,000	.00201	.00017	.00059	.00012	
212,700	30,090	....	....	....	....	Tensile strength.

Fractured, ″.9 from neck. Appearance, granular, mottled.

CAST IRON.

SAND CASTING.

No. 2770.

Original dimensions of specimen:
Length, 12''.97.
Diameter, 3''.
Sectional area, 7.069 square inches.
Gauged length, 10''.
(See Report 1889, page 651, for earlier test of this specimen. Test resumed after a period of rest of four months.)

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,069	1,000	....	.0769	Permanent set when test was discontinued.
85,345	5,000	.0790	....	
70,690	10.000	.0818	....	
106,035	15,000	.0847	....	
141,380	20,000	.0876	....	
176.725	25,000	.0905	....	
212.070	30.000	.0937	....	
247.415	35.000	.0968	....	
282,760	40,000	.0999	....	
247,415	34,000	.0975	....	
212,070	30.000	.0949	....	
176,725	25,000	.0918	....	
141,380	20.000	.0889	....	
106,035	15,000	.0860	....	
70,690	10.000	.0830	....	
35,345	5,000	.0795	.0769	
70,690	10,000	.0817	....	
106,035	15,000	.0848	....	
141,380	20,000	.0877	....	
106,035	15,000	.0850	....	
70.690	10,000	.0822	....	
35,345	5,000	.0793	.0769	
85,345	5.000	.0789	....	
70,690	10,000	.0817	....	
106.035	15,000	.0847	....	
141,380	20,000	.0877	....	
176,725	25.000	.0906	....	
212,070	80,000	.0936	....	
247,415	85,000	.0966	....	
282,760	40,000	.0998	....	
247,415	85,000	.0974	....	
212,070	30,000	.0944	....	
176.725	25,000	.0917	....	
141,380	20,000	.0888	....	
106,035	15.000	.0857	....	
70,690	10.000	.0827	....	
35,345	5,000	.0795	.0769	
282,760	40,000	....	....	Repeated 100 times in one hour and a quarter.
7,069	1,000	....	.0769	
35,345	5,000	.0790	....	
70,690	10,000	.0819	....	
106.035	15,000	.0848	....	
141.380	20,000	.0878	....	
176,725	25,000	.0907	....	
212.070	30,000	.0956	....	
247,415	35,000	.0966	....	
282,760	40,000	.0996	....	
247,415	35,000	.0970	....	
212.070	30,000	.0943	....	
176,725	25,000	.0916	....	
106,035	15,000	.0857	....	
70,690	10,000	.0825	....	
35,345	5,000	.0794	.0769	
282,760	40,000	.0995	....	
318,105	45,000	.1028	....	
353,450	50,000	.1067	....	
424,140	60,000	.1177	....	

No. 2770—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
388,795	55,000	.1160	....	
353,450	50,000	.1134	....	
318,105	45,000	.1106	....	
282,760	40,000	.1080	....	
247,415	35,000	.1050	....	
212,070	30,000	.1020	....	
176,725	25,000	.0989	....	
141,380	20,000	.0956	....	
106,035	15,000	.0920	....	
70,690	10,000	.0884	....	
35,345	5,000	.0842	.0806	
35,345	5,000	.0830	....	
70,690	10,000	.0858	....	
106,035	15,000	.0887	....	
141,380	20,000	.0917	....	
176,725	25,000	.0946	....	
212,070	30,000	.0977	....	
247,415	35,000	.1007	....	
282,760	40,000	.1041	....	
318,105	45,000	.1073	....	
353,450	50,000	.1107	....	
388,795	55,000	.1144	....	
424,140	60,000	.1195	....	
388,795	55.000	.1173	....	
353,450	50,000	.1146	....	
318,105	45,000	.1119	....	
282,760	40,000	.1091	....	
247,415	35.000	.1063	....	
212,070	30,000	.1033	....	
176,725	25,000	.1000	....	
141,380	20,000	.0970	....	
106,035	15,000	.0935	....	
70,690	10,000	.0899	....	
35,345	5,000	.0858	.0820	
35,345	5,000	.0843	....	
70,690	10,000	.0873	....	
106,035	15,000	.0903	....	
141,380	20,000	.0931	....	
176,725	25,000	.0962	....	
212,070	30,000	.0991	....	
247,415	35,000	.1024	....	
282,760	40,000	.1035	....	
247,415	35,000	.1028	....	
212,070	30,000	.1000	....	
176,725	25,000	.0973	....	
141,380	20,000	.0944	....	
106,035	15,000	.0915	....	
70,690	10,000	.0883	....	
35,345	5,000	.0850	.0820	

Total length, 12″.870.

Specimen heated by being placed on hot plates till its length was 12″.938 .·. expansion = .″068.

Estimated temperature, 1,222° Fahr.

Cooled in the open air.

The apparent length of the bar after above annealing and cooling was 12″.872.

The recovery of .″002 here shown received confirmation by the micrometer used for measuring the compression within the gauged length, which appeared to show a recovery of .″0032.

The change in condition of the measured surfaces which occurred during the annealing process prevented a closer determination of the effect of annealing on the length of the bar, but from these measurements it is probable that annealing produced a permanent elongation of the bar.

No. 2770—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7, 069	1, 000	....	. 0788	
35, 345	5, 000	. 0807	....	
70, 690	10, 000	. 0837	. 0788	
106. 035	15, 000	. 0867	....	
141, 380	20, 000	. 0898	. 0789	
176. 725	25, 000	. 0927	....	
212. 070	30, 000	. 0957	. 0790	
247. 415	35, 000	. 0987	....	
282, 760	40, 000	. 1018	....	
247, 415	35, 000	. 0992	....	
212, 070	30, 000	. 0964	....	
176, 725	25, 000	. 0938	....	
141, 380	20, 000	. 0907	....	
106. 035	15, 000	. 0878	....	
70, 690	10, 000	. 0847	....	
35, 345	5, 000	. 0815	. 0792	
35, 345	5, 000	. 0812	....	
70, 690	10, 000	. 0842	....	
106, 035	15, 000	. 0870	....	
141, 380	20, 000	. 0900	....	
176, 725	25, 009	. 0930	....	
212, 070	30, 000	. 0959	....	
247, 415	35, 000	. 0988	....	
141, 380	20, 000	. 0907	. 0792	
282, 760	40, 000	. 1017	....	
353, 450	50, 000	. 1082	. 0793	
424, 140	60, 000	. 1109	. 0803	
459, 485	65, 000	. 1230	. 0831	
494, 830	70, 000	. 1695	....	
459, 485	65. 000	. 1677	....	
424, 140	60; 000	. 1650	....	
388, 795	55, 000	. 1624	....	
353, 450	50, 000	. 1597	....	
318, 105	45, 000	. 1569	....	
282, 760	40, 000	. 1540	....	
247, 415	35, 090	. 1509	....	
212. 070	30, 000	. 1478	....	
176, 725	25, 000	. 1445	....	
141, 380	20, 000	. 1409	....	
106, 035	15, 000	. 1373	....	
70, 690	10, 000	. 1 30	....	
35, 345	5. 000	. 1285	. 1241	**Set after 15 minutes' rest, ".1235.**
35, 345	5, 000	. 1259	....	
70, 690	10, 000	. 1289	....	
106. 035	15, 000	. 1320	....	
141, 380	20, 000	. 1348	....	
176, 725	25, 000	. 1380	....	
212, 070	30, 000	. 1400	....	
247, 415	35. 000	. 1440	....	
282. 760	40, 000	. 1473	....	
247. 415	35, 000	. 1447	....	
212, 070	30. 000	. 1420	....	
176. 725	25. 000	. 1392	....	
141, 380	20. 000	. 1362	....	
106, 035	15. 000	. 1332	....	
70, 690	10, 000	. 1300	....	
35, 345	5, 000	. 1266	. 1238	
565, 520	80, 000	....	....	
530, 175	75, 000	. 2703	....	
494. 830	70, 000	. 2679	....	
450, 485	65, 000	. 2652	....	
424, 140	60, 000	. 2625	....	
388, 795	55, 000	. 2598	....	
353, 450	50, 000	. 2568	....	
318, 105	45, 000	. 2540	....	
282, 760	40. 000	. 2507	....	
247, 415	35, 000	. 2475	....	
212. 070	30, 000	. 2440	....	
176, 725	25, 000	. 2405	....	
141, 380	20, 000	. 2366	....	
106, 035	15, 000	. 2323	....	
70, 690	10, 000	. 2279	....	
35, 345	5, 000	. 2227	. 2173	
....	....	....	. 2160	**After resting 1 hour.**
35, 345	5, 000	. 2190	....	
70, 690	10, 000	. 2220	....	
106, 035	15, 000	. 2250	....	

No. 2770—Continued.

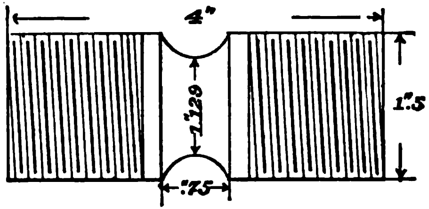
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
141,380	20,000	.2280	....	
176,725	25,000	.2310	....	
212,070	30,000	.2342	....	
247,415	35,000	.2373	....	
282,760	40,000	.2405	....	
247,415	35,000	.2379	....	
212,070	30,000	.2352	....	
176,725	25,000	.2322	....	
141,380	20,000	.2293	....	
106,035	15,000	.2262	....	
70,690	10,000	.2232	....	
35,345	5,000	.2199	.2164	
600,865	85,000	....	....	Specimen bent. Assumes an ogee shape.
530,175	75,000	.3398	....	
494,830	70,000	.3374	....	
459,485	65,000	.3345	....	
424,140	60,000	.3316	....	
388,795	55,000	.3288	....	
353,450	50,000	.3256	....	
318,105	45,000	.3227	....	
282,760	40,000	.3195	....	
247,415	35,000	.3160	....	
212,070	30,000	.3127	....	
176,725	25,000	.3088	....	
141,380	20,000	.3045	....	
106,035	15,000	.3006	....	
70,690	10,000	.2955	....	
35,345	5,000	.2900	.2849	
35,345	5,000	.2868	....	
70,690	10,000	.2898	....	
106,035	15,000	.2930	....	
141,380	20,000	.2958	....	
176,725	25,000	.2987	....	
212,070	30,000	.3019	....	
247,415	35,000	.3050	....	
282,760	40,000	.3080	....	
247,415	35,000	.3058	....	
212,070	30,000	.3028	....	
176,725	25,000	.3003	....	
141,380	20,000	.2975	....	
106,035	15,000	.2943	....	
70,690	10,000	.2911	....	
35,345	5,000	.2875	.2844	
636,210	90,000	....	....	Maximum load applied.

Metal began to disintegrate at spongy spot near the end of the specimen.

Cracks oblique to the axis of the specimen developed on part of the cylindrical surface.

CAST IRON FROM WATERTOWN ARSENAL FOUNDRY, AND PIG IRONS.

Form of specimens.



CAST IRON FROM WATERTOWN ARSENAL FOUNDRY.

No. of test.	Description.	Marks.	Chemical composition.								Tensile strength per square inch.	Fracture.	Remarks.
			Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.			
			Total.	Graphitic.	Combined.								
											Pounds.		
4389	12-inch mortar shell	12 M Sh H_4 B L_1	3.145	1.841	1.704	0.320	0.850	0.133	0.462		26,720	Granular, mottled	
4558	do	12 M Sh H_5 B L_1	3.204	2.210	0.994	0.250	0.755	0.145	0.556		26,120	do	
4559	do	12 M Sb H_6 B L_1	3.196	1.950	1.246	0.300	0.850	0.132	0.530		26,590	do	
4560	do	12 M Sh H_6 B T_1									25,040	do	
4561	do	do									24,760	do	Second specimen.
4562	do	12 M Sh H_9 B L_1									24,350	do	
4563	do	12 M Sh H_{10} B L_1									27,460	do	
4574	do	12 M Sh H_{14} B L_1									24,860	do	
4575	do	12 M Sh H_{16} B L_1									26,670	do	
6011	do	12 M Sh H_{18} B L_1									25,890	do	
6032	do	12 M Sh H_{21}									24,510	do	
6033	do	do									23,580	do	From base.
6034	do	12 M Sh H_{24}									24,890	do	
6035	do	do									23,260	do	Second specimen.
6046	do	12 M Sh H_{26}	3.235	2.582	0.653	0.332	1.120	0.028	0.464		28,370	do	
5001	do	12 M Sh H_{27} B L_1									28,090	do	
5002	do	12 M Sh H_{28} B L_1									26,770	do	

CAST IRON FROM WATERTOWN ARSENAL FOUNDRY, AND PIG IRONS.

No. of test.	Description.	Marks.	Chemical composition.								Tensile strength per square inch.	Fracture.	Remarks.
			Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.			
			Total.	Graphitic.	Combined.								
											Pounds.		
5003	12-inch mortar shell	12 M Sh H_{29} B L_1									29,070	Granular, mottled	
5004	....do	12 M Sh H_{30} B L_1									26,000	Granular	
5005	....do	12 M Sh H_{31} B L_1									26,380	Granular, mottled	
5007	....do	12 M Sh H_{32} B L_1	3.195	2.806	0.389	0.415	0.905	0.120	0.491	0.004	30,350	......do	
5008	....do	12 M Sh H_{36} B L_1									29,580	......do	
5011	....do	12 M Sh H_{37} B L_1									29,980	Granular	
5009	....do										24,230	Fine granular, slightly mottled.	Cast from air furnace.
5013	....do										23,630	Fine granular	
5019	Chassis for 8" B. L. rifle carriage.										29,370	Granular, mottled	From cupola furnace.
5020	....do										25,920	Very fine granular. Grey, with small hard spots.	From air furnace.

PIG IRONS.

No. of test.	Description.	Marks.	Total.	Graphitic.	Combined.	Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.	Tensile strength per square inch.	Fracture.	Remarks.
4388	Muirkirk pig										28,040	Granular	
5018	....do		3.109	2.	1.199	0.770	0.940	0.115	0.475	0.000	33,190	Fine granular	
4390	....do	Pig No. 2									34,450	......do	
5006	Lone star pig iron.	Lone Star	3.239	3.141	0.098	0.120	3.335	0.030	0.277	None.	12,490	Granular, varying from coarse to fine.	
5012	Katahdin pig	Katahdin pig									25,040	Fine granular	
5014	From Boiling Springs Iron Company.	II	3.379	2.980	0.399	1.195	1.000	0.025	0.624	None.	17,380	......do	
5015	....do	III	3.378	2.917	0.461	1.000	1.500	0.025	0.495	None.	18,990	Fine granular of varying fineness.	
5016	....do	IIII	3.002	2.410	0.592	0.415	0.970	0.040	0.740	None.	24.690	Fine granular, 50 per cent of surface spongy.	
5017	....do	IIII½	3.016	2.893	0.123	0.884	1.310	0.035	1.030	None.	20,010	Fine granular, mottled.	

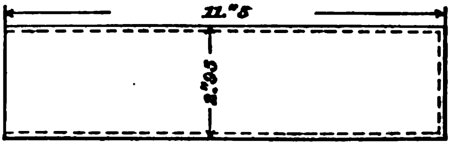
COMPRESSION TESTS OF CHILLED CAST IRON.

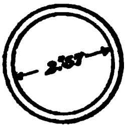
For the original tests of these specimens, see Report of tests 1889, pages 653, 656.

The interior unchilled metal was bored out, leaving the hardened shell to be tested in the present instance.

No. 5771.

ORIGINAL TEST NO. 2778.





Average diameter of hole, 2''.57.
Sectional area, 1.65 square inches.
Gauged length, 9.94 square inches.

Applied loads.		In gauged lengths.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,650	1,000	0.	0.	Initial load.
8,250	5,000	.0022	.0001	
16,500	10,000	.0044	.0002	
24,750	15,000	.0065	.0003	
33,000	20,000	.0087	.0004	
41,250	25,000	.0110	.0005	E=23,660,000, between 5,000 and 40,000 pounds per square inch.
49,500	30,000	.0132	.0006	
57,750	35,000	.0153	.0006	
66,000	40,000	.0175	.0007	
74,250	45,000	.0197	.0008	
82,500	50,000	.0220	.0009	
90,750	55,000	.0244	.0012	
99,000	60,000	.0268	.0013	
107,250	65,000	.0291	.0014	
115,500	70,000	.0314	.0015	Snapping sound.
123,750	75,000	.0339	.0016	
132,000	80,000	.0363	.0019	

Test discontinued, removed from the testing machine, and heated bright red, then cooled in the open air.

After heating as above, the metal which was chilled was softened and could be filed easily.

Test resumed.

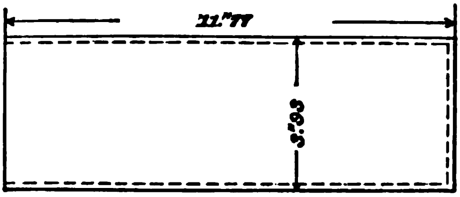
No. 5771—Continued.

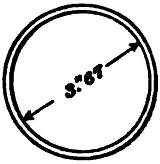
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1, 650	1, 000	0.	0.	Micrometer reset at zero.
8, 250	5, 000	.0010	0.	
16, 500	10, 000	.0029	.0001	
24, 750	15, 000	.0052	.0003	
83, 000	20, 000	.0076	.0004	
41, 250	25, 000	.0100	.0006	E = 22,300,000, between 5,000 and 40,000 pounds per square inch.
49, 500	30, 000	.0127	.0008	
57, 750	35, 000	.0152	.0010	
66, 000	40, 000	.0179	.0013	
74, 250	45, 000	.0210	.0018	
82, 500	50, 000	.0250	.0032	
90, 750	55, 000	.0308	.0060	
99, 000	60, 000	.0406	.0130	
8, 250	5, 000	.0146	....	
16, 500	10, 000	.0169	....	
24, 750	15, 000	.0191	....	
33, 000	20, 000	.0214	....	
41, 250	25, 000	.0236	.0130	
152, 300	92, 300	....	....	Ultimate strength.

Burst into small fragments.

No. 5772.

ORIGINAL TEST NO. 2896.





Diameter of hole, 3″.67.
Sectional area, 1.55 square inches.
Gauged length, 10″.

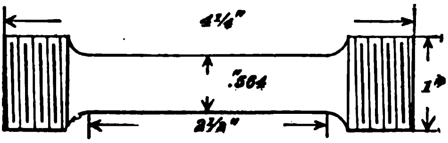
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1, 550	1, 000	0.	0.	Initial load.
7, 750	5, 000	.0019	0.	
15, 500	10, 000	.0040	0.	
23, 250	15, 000	.0060	0.	
31, 000	20, 000	.0080	.0001	
88, 750	25, 000	.0097	.0001	E = 24,820,000, between 5,000 and 40,000 pounds per square inch.
46, 500	80, 000	.0121	.0001	
54, 250	85, 000	.0142	.0002	
62, 000	40, 000	.0163	.0003	
69, 750	45, 000	.0184	.0004	
77, 500	50, 000	.0206	.0005	
85, 250	55, 000	.0228	.0008	
93, 000	60, 000	.0249	.0009	
100, 750	65, 000	.0271	.0011	
108, 500	70, 000	.0293	.0013	
116, 250	75, 000	.0317	.0015	
124, 000	80, 000	.0342	.0019	Snapping sound.
190, 900	123, 160	....	....	Ultimate strength.

Burst into small fragments.

From the appearance of the fragments the metal was chilled to a depth of .07±; hence in this specimen about seven-thirteenths of the thickness of the walls was hard chilled iron, the remaining part being unchilled metal.

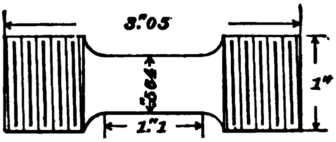
TWO SPECIMENS OF STEEL FROM SPRINGFIELD ARMORY.

No. 5545.



Marks, I W.
Sectional area, .25 square inch.
Elastic limit, 11,200 pounds=44,800 pounds per square inch.
Tensile strength, 21,680 pounds=86,720 pounds per square inch.
Elongation in 2 inches ".53=26:5 per cent.
Elongation of inch sections, ".31*, ".22.
Diameter at fracture, ".43. Area, .145 square inch.
Contraction of area, 41.9 per cent.
Appearance of fracture, silky. Cup shaped.

No. 5546.

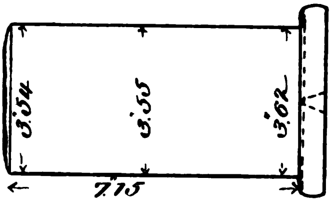


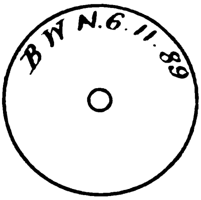
Marks, F C S.
Sectional area, .25 square inch.
Elastic limit, 17,800 pounds=71,200 pounds per square inch.
Tensile strength, 27,120 pounds=108,480 pounds per square inch.
Elongation in 1 inch, ".22.
Diameter at fracture, ".49. Area, .189 square inch.
Contraction of area, 24.6 per cent.
Appearance of fracture, fine granular; dull eccentric spot.

RAILWAY AXLES.

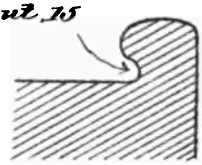
Wrought-Iron Railway Axle.

Fractured Journal.





The button was under-wore about .15



Enlarged view of button.

RAILWAY AXLES.

Specimens Nos. 4729 and 4730 were from the fractured journal of a wrought axle.

The axle was from a palace-car four-wheel truck, and had been in service about three years; the exact time is not known.

The journal had a progressive annular fracture which had reduced the solid metal to 2″.1 diameter at the time of final rupture.

Specimens Nos. 4731 and 4732 were from a section of a new wrought-iron axle.

The hammered specimens were metal drawn down from new axles.

TWO LONGITUDINAL SPECIMENS FROM FRACTURED JOURNAL.

No. 4729.

Diameter ″.564.
Sectional area, .25 square inch.
Gauged length, 4″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	....	
2,500	10,000	.0011	....	
5,000	20,000	.0025	0.	Elastic limit.
5,250	21,000	.0031	....	
5,500	22,000	.0069	....	
5,750	23,000	.0184	....	
6,000	24,000	.0255	....	
6,250	25,000	.0300	....	
6,500	26,000	.0405	....	
6,750	27,000	.0480	....	
7,000	28,000	.0580	....	
7,250	29,000	.0650	....	
7,500	30,000	.0823	....	
7,750	31,000	.0891	....	
8,000	32,000	.1020	....	
8,250	33,000	.1150	....	
8,500	34,000	.1520	....	
8,750	35,000	.17	....	
9,000	36,000	.19	....	
9,250	37,000	.21	....	
9,500	38,000	.23	....	
9,750	39,000	.26	....	
10,000	40,000	.29	....	
10,250	41,000	.32	....	
10,500	42,000	.36	....	
10,750	43,000	.40	....	
11,000	44,000	.43	....	
11,480	45,920	....	....	Tensile strength.
0	0	1.00	....	=25.0 per cent.

Elongation of inch sections: ″.44, ″.21, ″.19, ″.16.
Diameter at fracture, ″.43. Area, .145 square inch.
Contraction of area, 41.9 per cent.
Fractured ″.9 from neck. Appearance, fibrous.

No. 4730.

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 4″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	....	
2,500	10,000	.0014	....	
4,500	18,000	.0026	....	Elastic limit.
4,750	19,000	.0029	....	
5,000	20,000	.0033	.0010	
5,250	21,000	.0050	....	
5,500	22,000	.0080	....	
5,750	23,000	.0239	....	
6,000	24,000	.0310	....	
6,250	25,000	.0390	....	
6,500	26,000	.0483	....	
6,750	27,000	.0562	....	
7,000	28,000	.0660	....	
7,250	29,000	.0745	....	
7,500	30,000	.0880	....	
7,750	31,000	.0980	....	
8,000	32,000	.1130	....	
8,250	33,000	.1250	....	
8,500	34,000	.1430	....	
8,750	35,000	.1580	....	
9,000	36,000	.1830	....	
9,250	37,000	.2000	....	
9,500	38,000	.2250	....	
9,750	39,000	.2500	....	
10,000	40,000	2850	....	
10,250	41,000	.3168	....	
10,500	42,000	.39	....	
10,750	43,000	.45	....	
11,000	44,000	.56	....	
11,250	45,000	.74	....	
11,280	45,120	....	....	Tensile strength.
0	0	1.07	....	=26.8 per cent.

Elongation of inch sections, ″.20, ″.27, ″.42*, ″.18.
Diameter at fracture, ″.42. Area, .139 square inch.
Contraction of area, 44.4 per cent.
Fractured 2″.3 from neck. Appearance, fibrous.

TWO SPECIMENS FROM A SECTION OF AXLE 16″ LONG BY 5½″ DIAMETER.

No. 4731.

Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	....	
15,000	15,000	.0050	....	
16,000	16,000	.0052	....	
17,000	17,000	.0057	....	
18,000	18,000	.0060	....	
19,000	19,000	.0065	....	
20,000	20,000	.0070	.0002	Elastic limit.
21,000	21,000	.0078	....	
22,000	22,000	.0088	....	
23,000	23,000	.0131	....	
24,000	24,000	.0250	....	
25,000	25,000	.0431	.0340	
26,000	26,000	.0631	....	
27,000	27,000	.0720	....	
28,000	28,000	.0950	....	
29,000	29,000	.1280	....	
30,000	30,000	.1550	....	
31,000	31,000	.1830	....	
32,000	32,000	.2100	....	
33,000	33,000	.2320	....	
34,000	34,000	.2760	....	
35,000	35,000	.32	....	
36,000	36,000	.36	....	
37,000	37,000	.40	....	
38,000	38,000	.46	....	
39,000	39,000	.51	....	
40,000	40,000	.58	....	
				Rested 1 hour without load.
42,000	42,000	.59	....	
43,000	43,000	.61	....	
44,000	44,000	.88	....	
45,000	45,000	1.03	....	
46,000	46,000	1.26	....	Tensile strength.
0	0	1.34	....	= 13.4 per cent.

Elongation of inch sections: ″.12, ″.29,* ″.11, ″.11, ″.12, ″.11, ″.10, ″.12, ″.14, ″.12.

Diameter at fracture, .″1. Area, ″.785 square inch.

Contraction of area, 21.5 per cent.

Fractured 1″.5 from neck. Appearance, dull fibrous, slightly granular. Opened cracks along surface of the stem.

No. 4732.

Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0016	....	
10,000	10,000	.0032	....	
15,000	15,000	.0049	....	
16,000	16,000	.0055	....	
17,000	17,000	.0058	....	
18,000	18,000	.0061	....	
19,000	19,000	.0066	....	
20,000	20,000	.0069	.0005	Elastic limit.
21,000	21,000	.0083	....	
22,000	22,000	.0130	....	
23,000	23,000	.0290	....	
24,000	24,000	.0408	....	
25,000	25,000	.0573	.0481	
26,000	26,000	.0770	....	
27,000	27,000	.0950	....	
28,000	28,000	.1212	....	
29,000	29,000	.1400	....	
30,000	30,000	.1650	....	
31,000	31,000	.1920	....	
32,000	32,000	.2230	....	
33,000	33,000	.2540	....	
34,000	34,000	.2900	....	
35,000	35,000	.3290	....	
36,000	36,000	.39	....	
37,000	37,000	.43	....	
38,000	38,000	.49	....	
39,000	39,000	.56	....	
40,000	40,000	.61	....	
				Rested 40 minutes without load.
43,000	43,000	.62	....	
44,000	44,000	.94	....	
45,000	45,000	1.15	....	Tensile strength.
0	0	1.17	....	= 11.7 per cent.

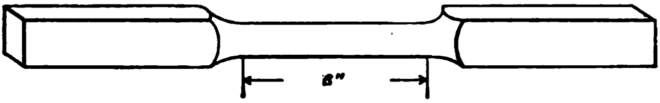
Elongation of inch sections: ″.11, ″.15, ″.19*, ″.12, ″.10, ″.11, ″.10, ″.10, ″.09, ″.10.

Diameter at fracture, 1″.04. Area, .849 square inch.

Contraction of area, 15.1 per cent.

Fractured 2″.7 from neck. Appearance, granular 90 per cent; fibrous 10 per cent. Opened cracks along the surface of stem.

HAMMERED SPECIMENS.



No. 5780.

Mark, 1.
Specimen drawn down from a new axle made of horseshoe iron.
Diameter, 1″.017.
Sectional area, .812 square inch.
Elastic limit, 21,300 pounds=26,230 pounds per square inch.
Tensile strength, 40,860 pounds=50,320 pounds per square inch.
Elongation in 6 inches, 1″.51=25.1 per cent.
Elongation of inch sections, ″.18, ″.30, ″.49*, ″.20, ″.17, ″.17.
Diameter at fracture, ″.76. Area, .454 square inch.
Contraction of area, 44.1 per cent.
Appearance of fracture, fibrous.

No. 5781.

Marks, 11.
Specimen drawn down from a new axle made of scrap iron.
Diameter, 1″.019.
Sectional area, .815 square inch.
Elastic limit, 25,200 pounds=30,920 pounds per square inch.
Tensile strength, 42,700 pounds=52,390 pounds per square inch.
Elongation in 6 inches, 1″.48=24.7 per cent.
Elongation of inch sections, ″.30*, ″.35*, ″.16, ″.21, ″.28, ″.18.
Appearance of fracture, fibrous.

RAILWAY DRIVING WHEEL TIRES.

SPECIMENS FROM SECTIONS OF OLD WHEELS.

The brands of the tires and their cross-section dimensions were as follows:

Number of tire.	Brand.	Dimensions.	
		Width.	Thickness.
		Inches.	*Inches.*
1	F. Krupp, 1871, P. VII, U. S.	5¼	1.47
2	Vickers	5[illegible]	1.75
3	Nashua Iron and Steel Co. Cast Steel 1876	5[illegible]	1.8
4	.1 Standard ✝	5¾	1.65
5	Midvale S. Co. ✱ 24607	5[illegible]	1.63
6	Standard	6[illegible]	3

Nos. 1 to 5, inclusive, were old flanged tires; the thickness here recorded is the minimum to which they have been reduced in service.

No. 6 was a section of a new "blind" tire. Its name had apparently been stamped on recently, not being the original brand mark.

The specimens were taken out in a crosswise direction, and came from the middle of the thickness at the tread.

CHEMICAL COMPOSITION OF SECTIONS FROM RAILWAY DRIVING WHEEL TIRES.

Tension test number.	Mark.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
		Total.	Graphitic.	Combined.					
4628	1	0.505	0.028	0.477	0.330	0.329	0.020	0.091	0.239
4629	2	0.450	0.020	0.430	0.300	0.142	0.014	0.058	0.041
4630	3	0.472	0.017	0.455	0.376	0.029	0.019	0.059	0.025
4631	4	0.575	0.025	0.550	0.406	0.283	0.062	0.071	0.045
4632	5	0.563	0.020	0.543	0.360	0.162	0.044	0.106	0.026
4633	6	0.604	0.024	0.580	0.560	0.145	0.051	0.083	0.027

No. 4628.

Marks, 1.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	0.	
2,500	10,000	.0010	....	
5,000	20,000	.0021	....	
7,500	30,000	.0032	0.	
10,000	40,000	.0042	0.	
11,250	45,000	.0047	....	
11,500	46,000	.0048	....	
11,750	47,000	.0049	....	
12,000	48,000	.0051	....	
12,250	49,000	.0052	....	Elastic limit.
12,500	50,000	.0065	.0012	
12,750	51,000	.0070	....	
13,000	52,000	.0078	....	
13,250	53,000	.0083	....	
13,500	54,000	.0099	....	
13,750	55,000	.0110	....	
14,000	56,000	.0130	....	
14,500	58,000	.0165	....	
15,000	60,000	.0200	....	
15,500	62,000	.0230	....	
16,000	64,000	.0270	....	
16,500	66,000	.0302	....	
17,000	68,000	.0330	....	
17,500	70,000	.0375	....	
18,500	74,000	.05	....	
19,500	78,000	.06	....	
20,500	82,000	.07	....	
21,500	86,000	.08	....	
22,500	90,000	.09	....	
23,500	94,000	.10	....	
24,500	98,000	.11	....	
25,500	102,000	.15	....	
26,500	106,000	.18	....	
27,420	109,680	....	....	Tensile strength.
0	0	.28		= 9.3 per cent.

Elongation of inch sections: ″.16*, ″.07, ″.05.
Diameter at fracture, ″.52. Area, .2124 square inch.
Contraction of area, 15 per cent.
Fractured ¾″ from neck. Appearance, granular.

No. 4629.

Marks, 2.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	0.	
2,500	10,000	.0010	....	
5,000	20,000	.0020	....	
7,500	30,000	.0029	0.	
10,000	40,000	.0040	0.	
10,250	41,000	.0041	....	
10,500	42,000	.0042	....	Elastic limit.
10,750	43,000	.0135	....	
11,000	44,000	.0180	....	
11,250	45,000	.0240	....	
11,500	46,000	.0280	....	
11,750	47,000	.0300	....	
12,000	48,000	.0330	....	
12,250	49,000	.0349	....	
12,500	50,000	.0370	....	
13,000	52,000	.0425	....	
13,500	54,000	.0480	....	
14,000	56,000	.0545	....	
14,500	58,000	.0603	....	
15,000	60,000	.0670	....	
15,500	62,000	.0740	....	
16,000	64,000	.0820	....	
16,500	66,000	.0900	....	
17,000	68,000	.0990	....	
17,500	70,000	.1100	.1000	
18,500	74,000	.13	....	
19,500	78,000	.17	....	
20,500	82,000	.21	....	
21,500	86,000	.23	....	
22,240	88,960	....	....	Tensile strength.
0	0	.62	....	= 20.7 per cent.

Elongation of inch sections: ″.29,* ″.17, ″.15.
Diameter at fracture, ″.46. Area, .1662 square inch.
Contraction of area, 33.5 per cent.
Fractured 1″.10 from neck. Appearance, granular, silky center.

No. 4630.

Marks, 3.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	0.	
2,500	10,000	.0010	....	
5,000	20,000	.0020	....	
7,500	30,000	.0030	.0001	
10,000	40,000	.0041	.0002	
10,250	41,000	.0042	....	
10,500	42,000	.0044	....	Elastic limit.
10,750	43,000	.0052	....	
11,000	44,000	.0085	....	
11,250	45,000	.0094	....	
11,500	46,000	.0110	....	
11,750	47,000	.0129	....	
12,000	48,000	.0145	....	
12,250	49,000	.0162	....	
12,500	50,000	.0179	.0121	
12,750	51,000	.0199	....	
13,000	52,000	.0210	....	
13,500	54,000	.0250	....	
14,000	56,000	.0298	....	
14,450	57,800	....	....	Tensile strength.
0	0	.04	....	=1.3 per cent.

Elongation of inch sections: ″.01, ″.02*, ″.01.
Contraction of area inappreciable.
Fractured 1″.3 from neck. Appearance granular, with bolt o flaky metal across middle of surface.

No. 4631.

Marks, 4.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	0.	
2,500	10,000	.0010	....	
5,000	20,000	.0019	....	
7,500	30,000	.0030	0.	
10,000	40,000	.0040	0.	
11,250	45,000	.0046	....	
12,500	50,000	.0053	.0001	
12,750	51,000	.0055	....	
13,000	52,000	.0057	....	
13,250	53,000	.0059	....	
13,500	54,000	.0060	....	
13,750	55,000	.0062	.0008	Elastic limit.
14,000	56,000	.0067	....	
14,250	57,000	.0071	....	
14,500	58,000	.0077	....	
14,750	59,000	.0083	....	
15,000	60,000	.0092	....	
15,500	62,000	.0116	....	
16,000	64,000	.0128	....	
16,500	66,000	.0154	....	
17,000	68,000	.0184	....	
17,500	70,000	.0219	....	
18,000	72,000	.0239	....	
18,500	74,000	.0267	....	
19,000	76,000	.0300	....	
19,500	78,000	.0333	....	
20,000	80,000	.0368	....	
21,000	84,000	.05	....	
22,000	88,000	.06	....	
23,000	92,000	.07	....	
24,000	96,000	.075	....	
25,000	100,000	.08	....	
26,000	104,000	.09	....	
27,000	108,000	.11	....	
28,000	112,000	.13	....	
28,560	114,240	....	....	Tensile strength.
0	0	.14	....	=4.7 per cent.

Elongation of inch sections: ″.07*, ″.04, ″.03.
Diameter at fracture, ″.55. Area, .2376 square inch.
Contraction of area, 4.8 per cent.
Fractured ″.75 from neck. Appearance, medium fine granular, flaky.

No. 4632.

Marks, 5.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	0.	
2,500	10,000	.0009	....	
5,000	20,000	.0019	....	
7,500	30,000	.0029	—.0001	
10,000	40,000	.0040	—.0001	
11,250	45,000	.0048	0.	Elastic limit.
11,500	46,000	.0052	....	
11,750	47,000	.0062	....	
12,000	48,000	.0080	....	
12,250	49,000	.0090	....	
12,500	50,000	.0113	....	
12,750	51,000	.0124	....	
13.000	52,000	.0137	....	
13,250	53,000	.0151	....	
13,500	54,000	.0169	....	
13,750	55,000	.0185	.0115	
14,000	56,000	.0203	....	
14,250	57,000	.0213	....	
14,500	58,000	.0231	....	
14,750	59,000	.0250	....	
15,000	60,000	.0270	.0190	
15,500	62,000	.0308	....	
16,000	64,000	.0335	....	
16,500	66,000	.0378	....	
17,000	68,000	.0420	....	
17,500	70,000	.0464	.0369	
18,500	74,000	.06	....	
19,500	78,000	.07	....	
20,500	82,000	.08	....	
21,500	86,000	.09	....	
22,500	90,000	.10	....	
23,500	94,000	.13	....	
24,500	98,000	.16	....	
25,140	100,560	....	....	Tensile strength.
0	0	.16	....	= 5.3 per cent.

Elongation of inch sections: ″.03, ″.05, ″.08.*
Diameter at fracture, ″.54. Area, .229 square inch.
Contraction of area, 8.4 per cent.
Fractured ″.15 from neck; appearance, granular 95 per cent, flaky streak 5 per cent.

No. 4633.

Marks, 6.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	0.	
2,500	10,000	.0008	....	
5,000	20,000	.0018	....	
7,500	30,000	.0028	0.	
10,000	40,000	.0039	0.	
12,500	50.000	.0050	.0002	
12.750	51,000	.0051	....	
13,000	52,000	.0052	....	Elastic limit.
13,250	53,000	.0056	....	
13,500	54,000	.0064	....	
13,750	55,000	.0072	....	
14,000	56,000	.0079	....	
14,250	57,000	.0086	....	
14,500	58,000	.0100	....	
14,750	59,000	.0110	....	
15,000	60,000	.0123	.0055	
15,500	62,000	.0153	....	
16,000	64,000	.0180	....	
16,500	66,000	.0210	....	
17,000	68,000	.0242	....	
17,500	70,000	.0278	.0188	
18,000	72,000	.0297	....	
18,500	74,000	.0333	....	
19,000	76,000	.0363	....	
19,500	78,000	.0403	....	
19,520	78,080	....	....	Tensile strength.
0.	0.	.05	....	= 1.7 per cent.

Elongation of inch sections, ″.01, ″.01, ″.03.
Contraction of area inappreciable.
Fractured at the neck. Appearance, granular, streak of flaky metal across fractured surface.

No. 4634.

Marks, 6.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.
Specimen taken from near outside surface of tire.

Applied loads.		In gauged lengths.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	0.	
2,500	10,000	.0009	....	
5,000	20,000	.0019	....	
7,500	30,000	.0030	0.	
10,000	40,000	.0042	0.	
11,250	45,000	.0048	....	
11,500	46,000	.0049	....	
11,750	47,000	.0051	....	
12,000	48,000	.0052	....	Elastic limit.
12,250	49,000	.0057	....	
12,500	50,000	.0059	.0008	
12,750	51,000	.0062	....	
13,000	52,000	.0065	....	
13,250	53,000	.0068	....	
13,500	54,000	.0073	....	
13,750	55,000	.0079	.0019	
14,000	56,000	.0087	....	
14,250	57,000	.0098	....	
14,500	58,000	.0109	....	
14,750	59,000	.0114	....	
15,000	60,000	.0129	.0059	
15,500	62,000	.0155	....	
16,000	64,000	.0182	....	
16,500	66,000	.0213	....	
17,000	68,000	.0243	....	
17,500	70,000	.0281	.0190	
19,000	76,000	.04	....	
20,500	82,000	.05	....	
22,000	88,000	.06	....	
23,500	94,000	.08	....	
25,000	100,000	.10	....	
26,250	105,000	....	....	Tensile strength.
0.	0.	.10	....	=3.3 per cent.

Elongation of inch sections: ″.04, ″.03, ″.03.
Contraction of area inappreciable.
Fractured at neck. Appearance, granular.

TABULATION OF TENSION SPECIMENS FROM DRIVING WHEEL TIRES.

No. of test.	No. of tire.	Diameter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation in 3 inches.		Contraction of area.	Fracture.	Elongation of inch sections.
		Inch.	*Sq. in.*	*Pounds.*	*Pounds.*	*Inch.*	*Per ct.*	*Per cent.*		″ ″ ″
4628	1	.564	.25	49,000	109,680	.28	9.8	15.0	¾″ from neck. Granular	.16*, .07, .05
4629	2	.564	.25	42,000	88,960	.62	20.7	33.5	1″.10 from neck. Granular silky center	.29*, .17, .15
4630	3	.564	.25	42,000	57,800	.04	1.3	Inappreciable.	1″.3 from neck. Granular with belt of flaky metal across middle of fracture.	.01, .02*, .01
4631	4	.564	.25	55,000	114,240	.14	4.7	4.8	″.75 from neck. Medium fine granular flaky	.07*, .04, .03
4632	5	.564	.25	45,000	100,560	.16	5.3	8.4	″.15 from neck. Granular 95 per cent, flaky streak 5 per cent	.03, .05, .08*
4633	6	.564	.25	52,000	78,080	.05	1.7	Inappreciable.	At neck. Granular, streak of flaky metal across fractured surface	.01, .01, .03
4634	*6	.564	.25	48,000	105,000	.10	3.3	Inappreciable.	At neck. Granular	.04, .03, .03

* Specimen taken from near outside surface of tire.

STEEL RAILS.

TRANSVERSE TESTS AND TENSION TESTS.

STEEL RAILS.

CHEMICAL ANALYSES OF HEADS.

Physical tests published in Report of 1891 of rails, Nos. 28 to 37; Nos. 38 and 39 published herewith.

No. of rail.	Brand.	Chemical composition.					
		C.	Mn.	Si.	S.	P.	Cu.
28	Barrow Steel 1873 : : : : 55	0.172	0.286	0.143	0.059	0.065	0.021
31	Dowlais Steel 7–70 Guaranteed	0.405	0.474	0.045	0.060	0.080	0.052
33	Scranton Steel Co. 3–89	0.481	0.980	0.057	0.084	0.083	0.680
35	C R. M Co. 12–75	0.393	0.387	0.019	0.063	0.100	0.070
36	Wilson Cammel Cos Steel Sec 6–74 Dronfleld	0.371	0.504	0.210	0.072	0.074	0.068
37	....do	0.350	0.453	0.275	0.100	0.061	0.078
38	Troy S & I Co. 1886–'7	0.359	0.858	0.122	0.110	0.060	0.175
39	....do	0.350	0.847	0.103	0.108	0.060	0.303

No. 196.

OLD STEEL RAIL No. 33.

Branded "Troy S & I Co 1886 7".
Length, 122''.8.
Total weight, 218½ pounds.
Weight per yard, 64 pounds.
Ends supported 48'' apart.
Loaded on the base at the middle.

Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inch.*	
2,000	....	0.	0.	0.	Initial load.
4,000	....	.0168	.0168	....	
6,000	....	.0337	.0169	....	
8,000	....	.0474	.0137	....	
10,000	....	.0614	.0140	.0011	
12,000	....	.0750	.0136	....	
14,000	....	.0876	.0126	....	
16,000	....	.0998	.0122	....	
18,000	....	.1115	.0117	....	
20,000	....	.1235	.0120	.0024	
24,000	....	.13	.0065	....	
28,000	....	.15	.02	....	
32,000	....	.19	.04	....	
36,000	....	.21	.02	....	
40,000	....	.25	.04	....	
44,000	....	.34	.09	....	
48,000	....	.51	.17	....	
52,000	....	.80	.29	....	
56,000	....	1.11	.31	....	
57,800	101,180	....	....	....	Ultimate strength.

Granular appearance, radiating from one corner of the head. The metal from the surface of the head to a depth of ''.04 ∓ presented a smooth sheared appearance.

The rail took a permanent bend of 4° at the time of rupture.

Maximum fiber stress computed by the formula $R=\frac{Pld}{4I}$, in which

R=maximum fiber stress.
P =load applied, pounds.
l =length of rail between end supports.
d =distance from neutral axis to most remote fiber.
I =moment of inertia of cross section taken about the neutral axis.

No. 197.

From same rail as No. 196.
Ends supported 48″ apart.
Loaded on the head at the middle.

Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
2,000		0.	0.	0.	Initial load.
4,000		.0148	.0148		
6,000		.0310	.0162		
8,000		.0445	.0135		
10,000		.0584	.0139	.0010	
12,000		.0700	.0116		
14,000		.0832	.0132		
16,000		.0955	.0123		
18,000		.1083	.0128		
20,000		.1200	.0117	.0020	
22,000		.1340	.0140		
24,000		.1446	.0106		
26,000		.1572	.0126		
28,000		.1700	.0128		
30,000		.1820	.0120	.0046	
32,000		.1955	.0135		
34,000		.2106	.0151		
36,000		.2260	.0154		
38,000		.2475	.0215		
40,000		.2884	.0409	.0487	
42,000		.3435	.0551		
44,000		.4334	.0899		
46,000		.53	.0966		
48,000		.64	.11		
50,000		.81	.17		
52,000		.96	.15		
54,000		1.13	.17		
56.000		1.34	.21		
58,000		1.58	.24		
60,000		1.88	.30		
72,800	127,440	4.95	8.07		Maximum load applied with end supports 48″ apart.
Distance between end supports reduced to 36″.					
108,000	141,790				Ultimate strength.

Appearance of fracture, granular, radiating from a silky section at an outside corner of the base.

The metal adjacent to the surface of the head, and to a depth of ″.04±, had a smooth oblique, sheared appearance.

The rail took a permanent bend of 36° at the time of rupture.

No. 198.

End of same rail as tests Nos. 196 and 197.
Ends supported 36″ apart.
Loaded on the base at the middle.

The section along the middle of the length, at the middle bearing, was heated full red and cooled in the open air.

Under transverse load the maximum resistance was 92,400 pounds = 126,930 pounds maximum fiber stress.

Deflections were continued until the rail was bent 30°, when the test was discontinued.

The flanges buckled and the rail bent obliquely. There were no indications of fracture when the test ended.

TENSION SPECIMEN FROM HEAD OF STEEL RAIL NO. 38.

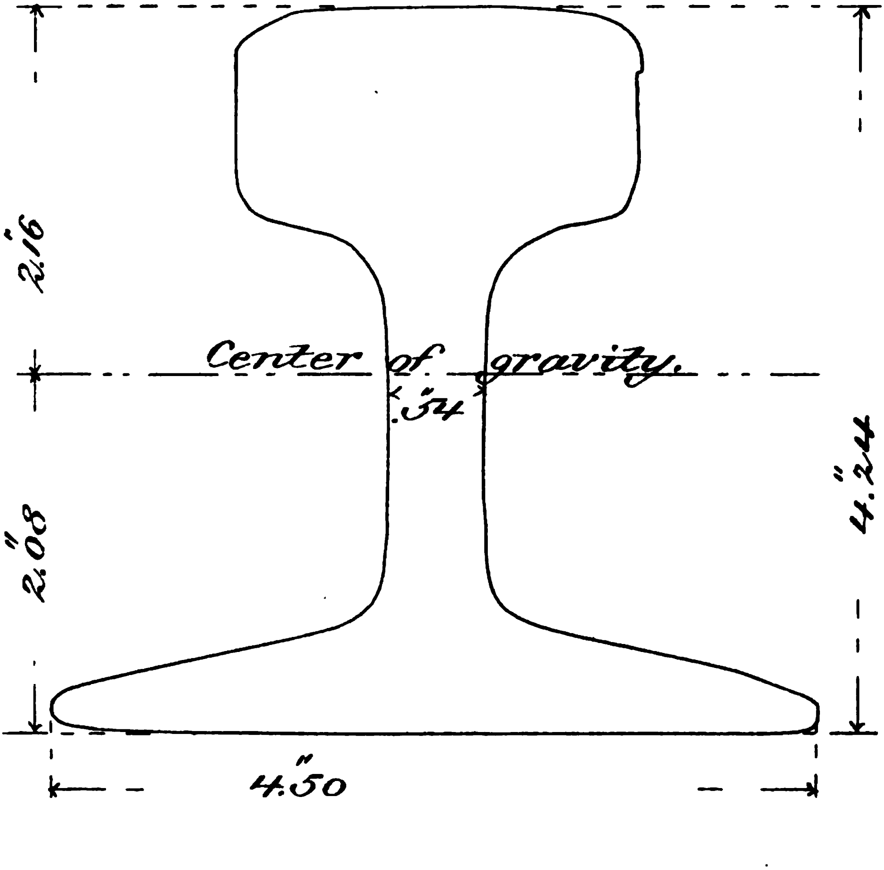
No. 4763.

Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	....	
5,000	10,000	.0016	....	
10,000	20,000	.0033	....	
12,500	25,000	.0041	....	
15,000	30,000	.0050	.0002	
17,500	35,000	.0059	....	
20,000	40,000	.0070	.0004	
20,500	41,000	.0072	....	
21,000	42,000	.0074	....	
21,500	43,000	.0076	....	
22,000	44,000	.0079	....	
22,500	45,000	.0083	.0008	
23,000	46,000	.0086	....	Elastic limit not well defined.
23,500	47,000	.0090	....	
24,000	48,000	.0101	....	
24,500	49,000	.0129	....	
25,000	50,000	.0169	.0083	
25,500	51,000	.0209	....	
26,000	52,000	.0232	....	
26,500	53,000	.0275	....	
27,000	54,000	.0312	....	
27,500	55,000	.0344	....	
28,000	56,000	.0392	....	
28,500	57,000	.0430	....	
29,000	58,000	.0470	....	
29,500	59,000	.0510	....	
30,000	60,000	.0555	.0436	
31,000	62,000	.065	....	
32,000	64,000	.075	....	
33,000	66,000	.085	....	
34,000	68,000	.095	....	
35,000	70,000	.105	....	
36,000	72,000	.115	....	
37,000	74,000	.13	....	
38,000	76,000	.14	....	
39,000	78,000	.15	....	
40,000	80,000	.17	....	
41,000	82,000	.19	....	
42,000	84,000	.21	....	
43,000	86,000	.23	....	
44,000	88,000	.25	....	
45,000	90,000	.27	....	Rested 48 hours without load.
46,000	92,000	.27	....	
47,000	94,000	.27	....	
48,000	96,000	.27	....	
49,000	98,000	.27	....	
50,000	100,000	.55	....	
50,180	100,360	....	....	Tensile strength.
0.	0.	.81	....	=16.2 per cent.

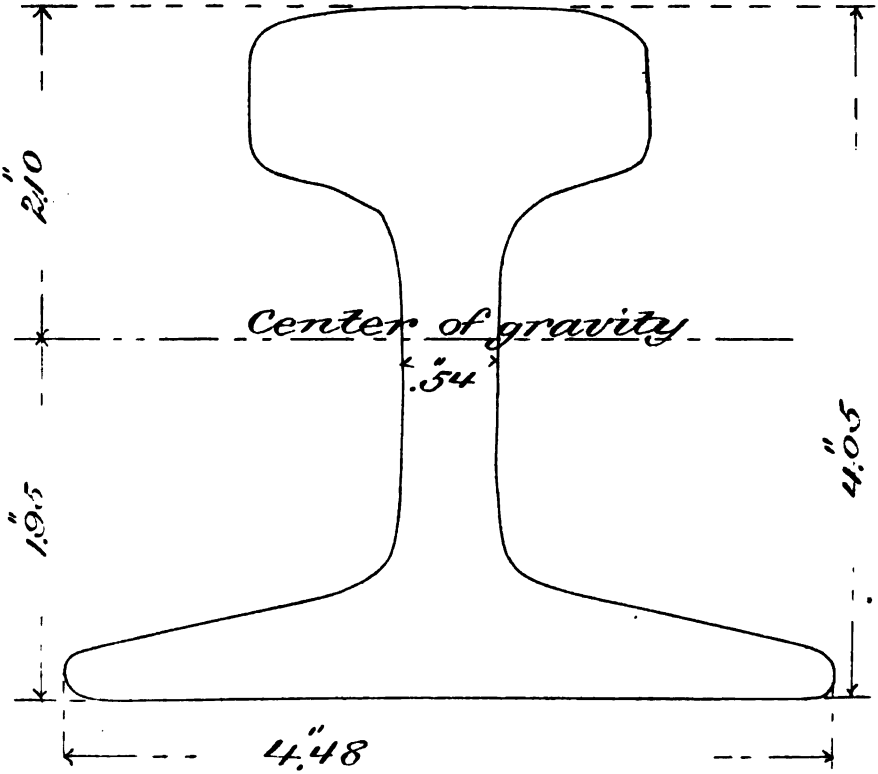
Elongation of inch sections; ″.15, ″.32*, ″.13, ″.11, ″.10.
Diameter at fracture, ″.66. Area, .342 square inch.
Contraction of area, 31.6 per cent.
Fractured 1″.75 from neck. Appearance, silky, interspersed with fine granulation.

Steel rail No. 38



Moment of Inertia 14.807

Steel rail No. 39



Moment of Inertia 13.731

No. 199.

OLD STEEL RAIL NO. 39.

Branded "Troy S & I Co. 1886 7".
Length, 121''.45.
Total weight, 209½ pounds.
Weight per yard, 62.1 pounds.
Ends supported 48'' apart.
Loaded on the base at the middle.

Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
2,000	....	0.	0.	0.	Initial load.
4,000	....	.0172	.0172	....	
6,000	....	.0360	.0188	....	
8,000	....	.0506	.0146	....	
10,000	....	.0660	.0154	.0003	
12,000	....	.0805	.0145	....	
14,000	....	.0946	.0141	....	
16,000	....	.1088	.0142	....	
18,000	....	.1225	.0137	....	
20,000	....	.1366	.0141	.0033	
22,000	....	.1520	.0154	....	
24,000	....	.1665	.0145	....	
26,000	....	.1828	.0163	....	
28,000	....	.2005	.0177	....	
30,000	....	.2212	.0207	.0211	
32,000	....	.24	.0188	....	
34,000	....	.26	.02	....	
36,000	....	.28	.02	....	
38,000	....	.33	.05	....	
40,000	....	.40	.07	....	
42,000	....	.47	.07	....	
44,000	....	.57	.10	....	
45,900	84,240	....	....	....	Ultimate strength.

Appearance of fracture, granular, radiating from one corner of the top surface of the head.

The metal from the top surface of the head to a depth of ''.04 to ''.05 presented a smooth sheared appearance.

The rail was permanently bent 2° at the time of rupture.

No. 200.

From same rail as No. 199.
Ends supported 48″ apart.
Loaded on the head at the middle.

Applied loads.		Deflections.	Successive deflections.	Deflection sets.	Remarks.
Total.	Maximum fiber stress.				
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
2,000	....	0.	0.	0.	Initial load.
4,000	....	.0195	.0195	....	
6,000	....	.0374	.0179	....	
8,000	....	.0520	.0146	....	
10,000	....	.0666	.0146	0.	
12,000	....	.0876	.0210	....	
14,000	....	.0946	.0070	....	
16,000	....	.1081	.0135	....	
18,000	....	.1215	.0134	....	
20,000	....	.1345	.0130	.0014	
22,000	....	.1486	.0141	....	
24,000	....	.1617	.0131	....	
26,000	....	.1748	.0131	....	
28,000	....	.1879	.0131	....	
30,000	....	.2018	.0139	.0040	
32,000	....	.2165	.0147	....	
34,000	....	.2305	.0140	....	
36,000	....	.2454	.0149	....	
38,000	....	.2631	.0177	....	
40,000	....	.2888	.0257	.0266	
42,000	....	.3395	.0507	....	
44,000	....	.4180	.0785	....	
46,000	....	.51	.0920	....	
48,000	....	.63	.12	....	
50,000	....	.78	.15	....	
52,000	....	.94	.16	....	
54,000	....	1.16	.22	....	
56,000	....	1.59	.43	....	
2,000	....	....	....	....	Rested two hours under this load.
58,000	....	1.63	.04	....	
60,000	....	1.67	.04	....	
62,000	....	2.18	.51	....	
64,009	....	2.60	.42	....	
66,000	....	2.98	.38	....	
68,000	....	3.57	.59	....	
70,000	....	4.31	.74	....	
76,000	139,480	5.00	.69	....	
		Distance between end supports reduced to 36″.			
107,000	147,280	....	....	....	
		Distance between end supports reduced to 30″.			
127,600	146,360	....	....	....	Maximum stress reached.

The load fell to 126,200 pounds when the rail had deflected so far as to come into contact with the transverse supporting beam of the testing machine.

The load was now removed and distance between end supports reduced to 24″.

Under 148,200 pounds=135,990 pounds maximum fiber stress, the rail fractured.

Appearance of fracture, granular; radiating from a silky section ¾″ wide at the edge of the base.

The metal next the head to a depth of ″.04 to ″.05 had a smooth sheared appearance.

The rail was permanently bent 41½ degrees at the time of rupture.

No. 201.

Part of same rail used in tests Nos. 199 and 200. Tested for bending only. Ends supported 36″ apart. Loaded on the base at the middle. Before testing, the middle section was heated full red and cooled in the open air. The rail was bent 28° without signs of fracture. Deflection took an oblique course; the flanges buckled.

TENSION SPECIMEN FROM HEAD OF STEEL RAIL NO. 39.

No. 4764.

Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0016	....	
10,000	20,000	.0033	....	
15,000	30,000	.0050	0.	
17,500	35,000	.0058	....	
20,000	40,000	.0067	.0001	
20,500	41,000	.0069	....	
21,000	42,000	.0070	....	
21,500	43,000	.0072	....	
22,000	44,000	.0075	....	
22,500	45,000	.0077	.0002	
23,000	46,000	.0080	....	
23,500	47,000	.0083	....	
24,000	48,600	.0085	....	
24,500	49,000	.0088 .0091	....	Elastic limit.
25,000	50,000	.0106	.0022	
25,500	51,000	.0115	....	
26,000	52,000	.0125	....	
26,500	53,000	.0144	....	
27,000	54,000	.0158	....	
27,500	55,000	.0188	....	
28,000	56,000	.0229	....	
28,500	57,000	.0300	....	
29,000	58,000	.0510	....	
29,500	59,000	.0613	....	
30,000	60,000	.0654	.0537	
31,000	62,000	.0732	....	
32,000	64,000	.0820	....	
33,000	66,000	.0915	....	
34,000	68,000	.1042	....	
35,000	70,000	.1131	....	
36,000	72,000	.1260	....	
37,000	74,000	.1375	....	
38,000	76,000	.1525	....	
39,000	78,000	.1666	....	
40,000	80,000	.1815	....	Rested 48 hours without load.
41,000	82,000	.18+	....	
42,000	84,000	.18+	....	
43,000	86,000	.18+	....	
44,000	88,000	.19	....	
44,500	89,000	.26	....	
45,000	90,000	.28	....	
45,500	91,000	.30	....	
46,000	92,000	.33	....	
47,000	94,000	.38	....	
48,000	96,000	.49	....	
48,620	97,240	....	....	Tensile strength.
0	0	.71	....	=14.2 per cent.

Elongation of inch sections: ″.25*, ″.14, ″.12, ″.11, ″.09. Diameter at fracture, ″.70. Area, .385 square inch. Contraction of area, 23.0 per cent. Fractured, ″.75 from neck. Appearance, granular, dull spot at circumference.

COLD ROLLED IRON SHAFT, 1 1-4 INCHES DIAMETER.

Chemical composition of specimen No. 4639.

Total carbon	0.036
Graphitic carbon	0.009
Combined carbon	0.027
Manganese	None.
Silicon	0.253
Sulphur	0.014
Phosphorus	0.123
Copper	None.

These experiments were made for the purpose of showing the effect of annealing, at different temperatures, on cold rolled iron.

While there was apparently some loss in tensile strength after annealing at lower temperatures, a decided loss occurred after exposed to a temperature of 683° Fahr. The elastic limits had remained undisturbed up to this temperature. At this time the tensile curve begins to show a jog at or in the vicinity of the elastic limit. This phase in the state of the metal is at first marked by the specimen developing considerable stretch at the elastic limit without increase of stress.

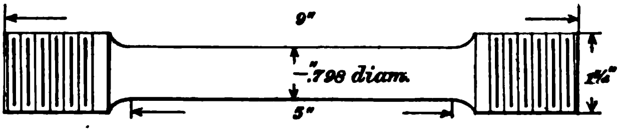
After annealing at 980° Fahr. the jog was more pronounced; now the metal, soon after passing the elastic limit, stretched under diminished loads.

This behavior continued until annealing at 1768° Fahr., when the jog disappeared, but the elastic limit by this annealing temperature was brought very low, and the total elongation was greater than displayed by the other specimens at that point of the curve where the jog had occurred.

The elastic limit, it appears, was lowered by annealing at a more rapid rate than the tensile strength.

The specimen heated bright cherry red and suddenly cooled by quenching in brine showed higher tensile strength than the corresponding specimen which was cooled from the same heat in oil, and the elongation under stresses between the elastic limit and tensile strength were much less in the former than the latter specimen.

EIGHTEEN TENSION SPECIMENS TAKEN FROM SHAFT.



No. 4638.

Marks, C. R.
Diameter, ".798.
Sectional area, .50 square inch.
Gauged length, 5".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	0.	
5,000	10,000	.0016	....	
7,500	15,000	.0026	....	
10,000	20,000	.0034	.0002	
12,500	25,000	.0044	....	
15,000	30,000	.0053	.0002	
17,500	35,000	.0062	....	
20,000	40,000	.0072	.0002	
22,500	45,000	.0081	....	
23,000	46,000	.0084	....	
23,500	47,000	.0087	....	
24,000	48,000	.0089	....	Elastic limit. (Approximate.)
24,500	49,000	.0094	....	
25,000	50,000	.0097	.0005	
25,500	51,000	.0104	....	
26,000	52,000	.0110	....	
26,500	53,000	.0119	....	
27,000	54,000	.0139	....	
27,500	55,000	.0162	.0063	
28,000	56,000	.0194	....	
28,500	57,000	.0233	....	
29,000	58,000	.0296	....	
29,500	59,000	.0380	....	
30,000	60,000	.0530	.0411	
31,000	62,000	.09	....	
32,000	64,000	.15	....	
33,000	66,000	.25	....	
33,780	67,560	....	....	Tensile strength.
0	0	.68	....	=13.6 per cent.

Elongation of inch sections: ".11, ".30*, ".11, ".09, ".07.
Diameter at fracture, ".65. Area, .332 square inch.
Contraction of area, 33.6 per cent.
Fractured 1".8 from neck. Appearance, fibrous.

No. 4639.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	0.	
5,000	10,000	.0014	....	
10,000	20,000	.0034	0.	
15,000	30,000	.0052	....	
20,000	40,000	.0071	.0001	
22,500	45,000	.0082	.0001	
23,000	46,000	.0084	....	
23,500	47,000	.0086	....	Elastic limit (approximate).
24,000	48,000	.0089	....	
24,500	49,000	.0093	....	
25,000	50,000	.0095	.0005	
25,500	51,000	.0100	....	
26,000	52,000	.0104	....	
26,500	53,000	.0108	....	
27,000	54,000	.0111	....	
27,500	55,000	.0118	.0019..	
28,000	56,000	.0125	....	
28,500	57,000	.0131	....	
29,000	58,000	.0145	....	
29,500	59,000	.0170	....	
30,000	60,000	.0218	.0109	
5,000	10,000	....	....	Rested under this load fourteen hours.
29,500	59,000	.0218	....	
30,000	60,000	.0222	....	
30,500	61,000	.0224	....	
31,000	62,000	.0550	....	
31,500	63,000	.0850	....	
32,000	64,000	.1143	.1009	
2.500	5,000	.1017	....	
5,000	10,000	.1026	....	
7,500	15.000	.1037	....	
10,000	20,000	.1047	....	
12.500	25,000	.1055	....	
15,000	30,000	.1067	....	
17,500	35,000	.1077	....	
20,000	40,000	.1088	....	
22,500	45,000	.1099	....	
25,000	50.000	.1110	....	
22,500	45,000	.1102	....	
20.000	40,000	.1092	....	
17,500	35,000	.1083	....	
15,000	30.000	.1072	....	
12,500	25.000	.1061	....	
10,000	20,000	.1052	....	
7,500	15,000	.1042	....	
5,000	10,000	.1031	....	
2,500	5.000	.1020	.1010	
32,500	65,000	.1235	....	
33,000	66,000	.18	....	
33,500	67,000	.24	....	
33,660	67,320	.28	....	Tensile strength.
0.	0.	.48	....	=9.6 per cent.

Elongation of inch sections: ″.04, ″.05, ″.06, ″.07, ″.26*.
Diameter at fracture, ″.65. Area, .332 square inch.
Contraction of area, 33.6 per cent.
Fractured ″.8 from neck. Appearance fibrous.

Two specimens, Nos. 4640 and 4641, heated in oil bath to 200° Fahr., kept at this temperature two hours, then cooled to 70° Fahr. and tested.

No. 4640.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 per square inch.
Gauged length, 5″.
Annealed at 200° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0027	....	
10,000	20,000	.0036	....	
12,500	25,000	.0045	....	
15,000	30,000	.0053	0.	
17,500	35,000	.0062	....	
20,000	40,000	.0070	0.	
22,500	45,000	.0080	.0002	
23,000	46,000	.0083	....	Elastic limit.
23,500	47,000	.0087	....	
24,000	48,000	.0092	....	
24,500	49,000	.0102	....	
25,000	50,000	.0111	.0019	
25,500	51,000	.0127	....	
26,000	52,000	.0153	....	
26,500	53,000	.0193	....	
27,000	54,000	.0241	....	
27,500	55,000	.0325	.0218	
28,000	56,000	.0395	....	
28,500	57,000	.0576	....	
29,000	58,000	.0720	....	
29,500	59,000	.0989	....	
30,000	60,000	.1255	.1126	
30,500	61,000	.14	....	
31,000	62,000	.19	....	
31,500	63,000	.27	....	
32,000	64,000	.40	....	Tensile strength.
0.	0.	.65	....	=13.0 per cent.

Elongation of inch sections: ″.09, ″31*, ″.09, ″.09, ″.07.
Diameter of fracture, ″.65. Area .332 square inch.
Contraction of area, 33.6 per cent.
Fractured 1″.7 from neck. Appearance, fibrous.

No. 4641.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.
Annealed at 200° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0009	0.	
5,000	10,000	.0018	....	
10,000	20,000	.0037	....	
12,500	25,000	.0046	....	
15,000	30,000	.0056	.0002	
17,500	35,000	.0063	.0002	
20,000	40,000	.0071	.0001	
21,000	42,000	.0074	....	
21,500	43,000	.0077	....	
22,000	44,000	.0079	....	
22,500	45,000	.0082	.0002	
23,000	46,000	.0084	....	
23,500	47,000	.0086	....	Elastic limit (approximate).
24,000	48,000	.0090	....	
24,500	49,000	.0094	....	
25,000	50,000	.0100	.0009	
25,500	51,000	.0107	....	
26,000	52,000	.0117	....	
26,500	53,000	.0130	....	
27,000	54,000	.0164	....	
27,500	55,000	.0199	.0098	
28,000	56,000	.0227	....	
28,500	57,000	.0293	....	
29,000	58,000	.0397	....	
29,500	59,000	.0512	....	
30,000	60,000	.0714	.0597	
30,500	61,000	.0865	....	
31,000	62,000	.1200	....	
31,500	63,000	.14	....	
32,000	64,000	.19	....	
32,500	65,000	.24	....	
33,000	66,000	.33	....	
33,200	66,400	....	....	Tensile strength.
0.	0.	.78	....	= 15.6 per cent.

Elongation of inch sections: ″.08, ″.14, ″.35*, ″.13, ″.08.
Diameter at fracture, ″.64. Area, .322 square inch.
Contraction of area, 35.6 per cent.
Fractured 3″ from neck. Appearance, fibrous.

Nos. 4642 and 4643 annealed two hours at 200° Fahr. and one and one-half hours at 300° Fahr.

No. 4642.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.
Annealed at 300° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	0.	
5,000	10,000	.0016	....	
7,500	15,000	.0025	....	
10,000	20,000	.0033	.0001	
12,500	25,000	.0042	....	
15,000	30,000	.0052	.0001	
7,500	35,000	.0062	....	
19,000	38,000	.0068	....	
20,000	40,000	.0070	.0001	
22,500	45,000	.0080	.0001	
23,000	46,000	.0081	....	
23,500	47,000	.0083	....	
24,000	48,000	.0085	....	
24,500	49,000	.0088	....	Elastic limit.
25,000	50,000	.0093	.0005	
25,500	51,000	.0102	....	
26,000	52,000	.0133	....	
26,500	53,000	.0216	....	
27,000	54,000	.0270	....	
27,500	55,000	.0387	.0283	
28,000	56,000	.0469	....	
28,500	57,000	.0663	....	
29,000	58,000	.0848	....	
29,500	59,000	.1060	....	
30,000	60,000	.1400	.1274	
30,500	61,000	.16	....	
31,000	62,000	.21	....	
31,500	63,000	.27	....	
32,000	64,000	.34	....	
32,050	64,100	....	....	Tensile strength.
0	0	.67	....	=13.4 per cent.

Elongation of inch sections: ″.30,* ″.13, ″.10, ″.08, ″.06.
Diameter at fracture, ″.64. Area, .322 square inch.
Contraction of area, 35.6 per cent.
Fractured 1″ from the neck. Appearance, fibrous.

No. 4643.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.
Annealed at 300° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0027	....	
10,000	20,000	.0035	.0001	
12,500	25,000	.0044	....	
15,000	30,000	.0053	.0001	
17,500	35,000	.0061	....	
20,000	40,000	.0071	.0002	
20,500	41,000	.0073	....	
21,000	42,000	.0075	....	
21,500	43,000	.0077	....	
22,000	44,000	.0078	....	
22,500	45,000	.0081	0.	
26,000	52,000	.0103	....	
26,500	53,000	.0114	....	
27,000	54,000	.0190	....	
27,500	55,000	.0243	.0139	
28,000	56,000	.0322	....	
28,500	57,000	.0419	....	
29,000	58,000	.0542	....	
29,500	59,000	.0753	....	
30,000	60,000	.0932	.0612	
30,500	61,000	.1200	....	
31,000	62,000	.1510	....	
31,500	63,000	.19	....	
32,000	64,000	.23	....	
32,500	65,000	.31	....	
32,940	65,880	....	....	Tensile strength.
0.	0.	.71	....	=14.2 per cent.

Elongation of inch sections: ″.07, ″.10, ″.10, ″.20*, ″.24*.
Diameter at fracture, ″.63; area, .312 square inch.
Contraction of area, 37.6 per cent.
Fractured 1″.24 from neck. Appearance, fibrous.

No. 4644.

Marks, C R.
Diameter, ".798.
Sectional area, .50 square inch.
Gauged length, 5".
Annealed at 400° Fahr., one hour.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0026	....	
10,000	20,000	.0034	0.	
12,500	25,000	.0043	....	
15,000	30,000	.0052	.0001	
17,500	35,000	.0062	....	
20,000	40,000	.0071	.0001	
20,500	41,000	.0072	....	
21,000	42,000	.0074	....	
21,500	43,000	.0076	....	
22,000	44,000	.0078	....	
22,500	45,000	.0080	.0002	
23,000	46,000	.0083	....	
23,500	47,000	.0085	....	
24,000	48,000	.0087	....	
24,500	49,000	.0089	....	Elastic limit.
25,000	50,000	.0093	.0004	
25,500	51,000	.0097	....	
26,000	52,000	.0102	....	
26,500	53,000	.0114	....	
27,000	54,000	.0238	....	
27,500	55,000	.0300	.0199	
28,000	56,000	.0370	....	
28,500	57,000	.0526	....	
29,000	58,000	.0678	....	
29,500	59,000	.0893	....	
30,000	60,000	.1122	.1005	
30,500	61,000	.1350	....	
31,000	62,000	.1770	....	
31,500	63,000	.21	....	
32,000	64,000	.28	....	
32,500	65,000	.41	....	
32,520	65,040	....	....	Tensile strength.
0.	0.	.72	....	= 14.4 per cent.

Elongation of inch sections: ".08, ".15, ".29*, ".10, ".10.
Diameter at fracture, ".64. Area, .322 square inch.
Contraction of area, 35.6 per cent.
Fractured 1".7 from neck. Appearance, fibrous.

No. 4645.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0202 in 6 inches.
Estimated annealing temperature, 567° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0005	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0026	....	
10,000	20,000	.0034	....	
12,500	25,000	.0045	....	
15,000	30,000	.0053	.0002	
17,500	35,000	.0063	....	
20,000	40,000	.0072	.0002	
20,500	41,000	.0074	....	
21,000	42,000	.0076	....	
21,500	43,000	.0078	....	
22,000	44,000	.0080	....	
22,500	45,000	.0082	....	
23,000	46,000	.0084	....	
23,500	47,000	.0087	....	
24,000	48,000	.0089	....	
24,500	49,000	.0092	....	Elastic limit.
25,000	50,000	.0097	.0008	
25,500	51,000	.0112	....	
26,000	52,000	.0240	....	
26,500	53,000	.0325	....	
27,000	54,000	.0400	....	
27,500	55,000	.0561	....	
28,000	56,000	.0720	....	
28,500	57,000	.0910	....	
29,000	58,000	.1120	....	
29,500	59,000	.1350	....	
30,000	60,000	.1695	.1597	
30,500	61,000	.19	....	
31,000	62,000	.26	....	
31,500	63,000	.32	....	
31,970	63,940	....	....	Tensile strength.
0.	0.	.75	....	= 15 per cent.

Elongation of inch sections: ″.08, ″.12, ″.32*, ″.14, ″.09.
Diameter at fracture, ″.63. Area, .312 square inch.
Contraction of area, 37.6 per cent.
Fractured 2″.6 from neck. Appearance, fibrous.

No. 4646.

Marks, C R.
Diameter ″.798.
Sectional area, .50 square inch.
Expansion ″.0412 in 6 inches.
Estimated annealing temperature 1095° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0018	....	
7,500	15,000	.0026	....	
10,000	20,000	.0035	....	
12,500	25,000	.0044	....	
15,000	30,000	.0054	.0001	
17,500	35,000	.0064	....	
18,000	36,000	.0066	....	
18,500	37,000	.0069	....	
19,000	38,000	.0072	....	Elastic limit.
		.0139	....	
19,500	39,000	.0280	....	
20,000	40,000	.0575	....	
20,500	41,000	.0700	....	
21,000	42,000	.0850	....	
21,500	43,000	.1025	....	
22,000	44,000	.1200	....	
22,500	45,000	.1405	....	
23,000	46,000	.1610	....	
23,500	47,000	.19	....	
24,000	48,000	.22	....	
24,500	49,000	.26	....	
25,000	50,000	.30	....	
25,500	51,000	.26	....	
26,000	52,000	.44	....	
26,500	53,000	.58	....	
26,790	53,580	....	....	Tensile strength.
0.	0.	1.14	....	=22.8 per cent.

Elongation of inch sections: ″.21, ″.43*, ″.22, ″.17, ″.11.
Diameter at fracture, ″.60; area, .283 square inch.
Contraction of area, 43.4 per cent.
Fractured 1″.4 from the neck. Appearance, fibrous.

No. 4647.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0306 in 6 inches.
Estimated annealing temperature, 830° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	....	
5,000	10,000	.0017	....	
7,500	15,000	.0026	....	
10,000	20,000	.0035	.0001	
12,500	25,000	.0044	....	
15,000	30,000	.0053	.0001	
17,500	35,000	.0063	....	
19,000	38,000	.0067	....	
19,500	39,000	.0070	....	
20,000	40,000	.0072	.0002	
20,500	41,000	.0074	....	
21,000	42,000	.0076	....	
21,500	43,000	.0078	....	Elastic limit (approximate).
22,000	44,000	.0082	....	
22,500	45,000	.0085	.0006	
23,000	46,000	.0097	....	
23,500	47,000	.0231	....	
24,000	48,000	.0313	....	
24,500	49,000	.0445	....	
25,000	50,000	.0619	.0520	
25,500	51,000	.0712	....	
26,000	52,000	.0944	....	
26,500	53,000	.1149	....	
27,000	54,000	.1400	....	
27,500	55,000	.1654	.1537	
28,000	56,000	.19	....	
28,500	57,000	.24	....	
29,000	58,000	.29	....	
29,500	59,000	.40	....	
29,690	59,380	....	....	Tensile strength.
0.	0.	.73	....	=14.6 per cent.

Elongation of inch sections, ″.07, ″.18, ″.33*, ″.09, ″.06.
Diameter at fracture, ″.61. Area, .292 square inch.
Contraction of area, 41.6 per cent.
Fractured 2″.5 from neck. Appearance, fibrous.

No. 4648.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0320 in 6 inches.
Estimated annealing temperature, 866° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0006	0.	
5,000	10,000	.0015	....	
7,500	15,000	.0024	....	
10,000	20,000	.0033	0.	
12,500	25,000	.0043	....	
15,000	30,000	.0052	0.	
17,500	35,000	.0062	....	
20,000	40,000	.0072	....	
20,500	41,000	.0074	....	Elastic limit.
21,000	42,000	.0081 .0159	....	
21,500	43,000	.0340	....	
22,000	44,000	.0519	....	
22,500	45,000	.0630	.0536	
23,000	46,000	.0809	....	
23,500	47,000	.0976	....	
24,000	48,000	.1179	....	
24,500	49,000	.1355	....	
25,000	50,000	.1600	....	
25,500	51,000	.19	....	
26,000	52,000	.22	....	
26,500	53,000	.26	....	
27,000	54,000	.32	....	
27,500	55,000	.39	....	
28,000	56,000	.56	....	Tensile strength.
0	0	.84	....	=16.8 per cent.

Elongation of inch sections: ″.09, ″.11, ″.12, ″.15, ″.37*.
Diameter at fracture, ″.60. Area, .283 square inch.
Contraction of area, 43.4 per cent.
Fractured 1″ from neck. Appearance, fibrous.

No. 4649.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0366 in 6 inches.
Estimated annealing temperature, 980° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0006	0.	
5,000	10,000	.0015	....	
7,500	15,000	.0024	....	
10,000	20,000	.0033	.0001	
12,500	25,000	.0043	....	
15,000	30,000	.0052	.0001	
15,500	31,000	.0054	....	
16,000	32,000	.0056	....	
16,500	33,000	.0058	....	
17,000	34,000	.0060	....	
17,500	35,000	.0062	....	
18,000	36,000	.0064	....	
18,500	37,000	.0066	....	
19,000	38,000	.0069	....	
19,500	39,000	.0071	....	
20,000	40,000	.0073	.0003	
20,500	41,000	.0077	....	Elastic limit.
21,000	42,000	.0081	....	
		.0110	....	Load fell.
20,500	41,000	.0169	....	
21,000	42,000	.0402	....	
21,500	43,000	.0550	....	
22,000	44,000	.0680	....	
22,500	45,000	.0830	....	
23,000	46,000	.1000	....	
23,500	47,000	.1190	....	
24,000	48,000	.1400	....	
24,500	49,000	.1625	....	
25,000	50,000	.1905	....	
25,500	51,000	.24	....	
26,000	52,000	.28	....	
26,500	53,000	.32	....	
27,000	54,000	.39	....	
27,500	55,000	.51	....	
27,700	55,400	.69	....	Tensile strength.
0	0	.96	....	= 19.2 per cent.

Elongation of inch sections: ″.10, ″.15, ″.16, ″.36*, ″.19.
Diameter at fracture, ″.61. Area, .292 square inch.
Contraction of area, 41.6 per cent.
Fractured 1″.4 from neck. Appearance, fibrous.

No. 4650.

Marks, O R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0412 in 6 inches.
Estimated annealing temperature, 1095° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches,*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0026	....	
10,000	20,000	.0034	.0001	
12,500	25,000	.0043	....	
15,000	30,000	.0054	.0002	
16,000	32,000	.0058	....	
17,000	34,000	.0062	....	
17,500	35,000	.0064	.0003	
18,000	36,000	.0066	....	Elastic limit.
18,500	37,000	.0071	....	
19,000	38,000	.0074	....	
19,500	39,000	.0080	....	Load fell.
19,000	38,000	.0415	....	
19,500	39,000	.0498	....	
20,000	40,000	.0567	.0490	
20,500	41,000	.0770	....	
21,000	42,000	.0905	....	
21,500	43,000	.1094	....	
22,000	44,000	.1270	....	
22,500	45,000	.1515	.1420	
23,000	46,000	.16	....	
23,500	47,000	.20	....	
24,000	48,000	.23	....	
24,500	49,000	.28	....	
25,000	50,000	.30	....	
25,500	51,000	.34	....	
26,000	52,000	.48	....	
26,500	53,000	.68	....	
26,620	53,240	....	....	Tensile strength.
0	0	1.10	....	=22.0 per cent.

Elongation of inch sections: ″.14, ″.17, ″.16, ″.28, ″.35*.
Diameter at fracture, ″.60. Area, .283 square inch.
Contraction of area, 43.4 per cent.
Fractured 1″.3 from neck. Appearance, fibrous.

No. 4651.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0420 in 6 inches.
Estimated annealing temperature, 1115° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0027	....	
10,000	20,000	.0037	.0001	
12,500	25,000	.0046	....	
15,000	30,000	.0057	.0003	
15,500	31,000	.0058	....	
16,000	32,000	.0060	....	
16,500	33,000	.0062	....	
17,000	34,000	.0065	....	
17,500	35,000	.0067	.0004	
18,000	36,000	.0070	....	
18,500	37,000	.0074	....	
19,000	38,000	.0077	....	Elastic limit.
19,200	38,400	....	....	Load fell.
18,000	36,000	.0180 .0247	....	
15,500	37,000	.0565	....	
19,000	38,000	.0666	....	
19,500	39,000	.0850	....	
20,000	40,000	.1017	.0932	
20,500	41,000	.1120	....	
21,000	42,000	.1212	....	
21,500	43,000	.14	....	
22,000	44,000	.19	....	
22,500	45,000	.23	....	
23,000	46,000	.26	....	
23,500	47,000	.32	....	
24,000	48,000	.38	....	
24,500	49,000	.46	....	
25,000	50,000	.61	....	
25,320	50,640	....	....	Tensile strength.
0	0	1.08	....	=21.6 per cent.

Elongation of inch sections: ″.11, ″.15, ″.18, ″.40*, ″.24.
Diameter at fracture, ″.60. Area, .283 square inch.
Contraction of area, 43.4 per cent.
Fractured 1″.5 from neck. Appearance, fibrous.

No. 4652.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0605 in 6 inches.
Estimated temperature, 1,575° Fahr.
Annealed at 1,050° Fahr. four hours, then cooled, and afterwards annealed at the estimated temperature of 1,575° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	0.	
5,000	10,000	.0017	....	
7,500	15,000	.0025	....	
10,000	20,000	.0035	.0001	
12,500	25,000	.0045	....	
15,000	30,000	.0056	.0004	
15,500	31,000	.0059	....	
16,000	32,000	.0061	....	
16,500	33,000	.0063	....	
17,000	34,000	.0066	....	
17,500	35,000	.0068	.0006	
18,000	36,000	.0072	....	
18,400	36,800	....	....	Elastic limit; load fell.
17,000	34,000	.0114	....	
17,500	35,000	.0161	....	
18,000	36,000	.0330	....	
18,500	37,000	.0530	....	
19,000	38,000	.0750	....	
19,500	39,000	.0905	....	
20,000	40,000	.1080	.0995	
500	1,000	....	....	Rested under this load 1 hour.
20,500	41,000	.1104	....	
21,000	42,000	.1435	....	
21,500	43,000	.17	....	
22,000	44,000	.19	....	
22,500	45,000	.21	....	
23,000	46,000	.26	....	
23,500	47,000	.31	....	
24,000	48,000	.36	....	
24,500	49,000	.43	....	
25,000	50,000	.53	....	
25,420	50,840	....	....	Tensile strength.
0	0	1.11	....	=22.2 per cent.

Elongation of inch sections; ″.12, ″.15, ″.46*, ″.24, ″.14.
Diameter at fracture, ″.59. Area, .273 square inch.
Contraction of area, 45.4 per cent.
Fractured 2″.84 from neck. Appearance, fibrous.

No. 4653.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Heated bright cherry red and cooled in the open air.
Expansion, ″.103 in 9″.05.
Estimated temperature, 1,768° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0018	.0001	
7,500	15,000	.0029	.0003	
10,000	20,000	.0052	.0016	Elastic limit below 20,000 pounds.
10,500	21,000	.0057	....	
11,000	22,000	.0062	....	
11,500	23,000	.0077	....	
12,000	24,000	.0162	....	
12,500	25,000	.0296	.0253	
13,000	26,000	.0365	....	
13,500	27,000	.0509	....	
14,000	28,000	.0590	....	
14,500	29,000	.0703	....	
15,000	30,000	.0845	.0784	
15,500	31,000	.0936	....	
16,000	32,000	.1075	....	
16,500	33,000	.1245	....	
17,000	34,000	.1389	....	
17,500	35,000	.1591	.1520	
18,000	36,000	.1729	....	
18,500	37,000	.1965	....	
19,000	38,000	.21	....	
19,500	39,000	.26	....	
20,000	40,000	.27	....	
20,500	41,000	.31	....	
21,000	42,000	.33	....	
21,500	43,000	.36	....	
22,000	44,000	.42	....	
22,500	45,000	.43	....	
23,000	46,000	.52	....	
23,500	47,000	.62	....	
24,000	48,000	.80	....	
24,470	48,940	1.16	....	Tensile strength,
0	0	1.40	....	=28.0 per cent.

Elongation of inch sections: ″.21, ″.32, ″.45*, ″.22, ″.20.
Diameter at fracture, ″.60. Area, .283 square inch.
Contraction of area, 43.4 per cent.
Fractured 2″,8 from neck. Appearance, fibrous.

No. 4656.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Heated bright cherry red and quenched in brine.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	0.	
5,000	10,000	.0024	....	
7,500	15,000	.0043	.0014	
10,000	20,000	.0064	.0026	
10,500	21,000	.0068	....	
11,000	22,000	.0072	....	
11,500	23,000	.0078	....	
12,000	24,000	.0086	....	
12,500	25,000	.0094	.0047	
13,000	26,000	.0108	....	
13,500	27,000	.0114	....	
14,000	28,000	.0133	....	
14,500	29,000	.0155	....	
15,000	30,000	.0180	.0121	
15,500	31,000	.0220	....	
16,000	32,000	.0275	....	
16,500	33,000	.0360	....	
17,000	34,000	.0415	....	
17,500	35,000	.0541	.0469	
18,000	36,000	.0620	....	
18,500	37,000	.0755	....	
19,000	38,000	.0685	....	
19,500	39,000	.0995	....	
20,000	40,000	.1171	.1087	
20,500	41,000	.13	....	
21,000	42,000	.14	....	
21,500	43,000	.16	....	
22,000	44,000	.20	....	
22,500	45,000	.22	....	
23,000	46,000	.26	....	
23,500	47,000	.26+	....	
24,000	48,000	.33	....	
24,500	49,000	.33+	....	
25,000	50,000	.42	....	
25,000	51,000	.48	....	
26,000	52,000	.59	....	
26,500	53,000	.78	....	
26,590	53,180	.91	....	Tensile strength.
0	0	1.08	....	= 21.6 per cent.

Elongation of inch sections: ″.12, ″.16, ″20, ″.42*, ″.18.
Diameter at fracture, ″.63. Area, .312 square inch.
Contraction of area, 37.6 per cent.
Fractured 1″.9 from neck, Appearance, fibrous; trace of granulation,

No. 4657.

Marks, C R.
Diameter, ″.798.
Sectional area, .50 square inch.
Heated bright cherry red and quenched in oil.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0008	.0001	
5,000	10,000	.0020	.0004	
7,500	15,000	.0035	.0008	
10,000	20,000	.0055	.0018	
10,500	21,000	.0060	....	
11,000	22,000	.0065	....	
11,500	23,000	.0074	....	
12,000	24,000	.0089	....	
12,500	25,000	.0105	.0057	
13,000	26,000	.0159	....	
13,500	27,000	.0230	....	
14,000	28,000	.0315	....	
14,500	29,000	.0409	....	
15,000	30,000	.0463	.0404	
15,500	31,000	.0583	....	
16,000	32,000	.0620	....	
16,500	33,000	.0667	....	
17,000	34,000	.1002	....	
17,500	35,000	.1054	.0984	
18,000	36,000	.1214	....	
18,500	37,000	.1389	....	
19,000	38,000	.1559	....	
19,500	39,000	.1590	....	
20,000	40,000	.2024	.1946	
20,500	41,000	.22	....	
21,000	42,000	.25	....	
21,500	43,000	.28	....	
22,000	44,000	.31	....	
22,500	45,000	.32	....	
23,000	46,000	.40	....	
23,500	47,000	.43	....	
24,000	48,000	.51	....	
24,500	49,000	.59	....	
25,000	50,000	.70	....	
25,500	51,000	.97	....	
25,710	51,420	....	....	Tensile strength.
0	0	1.29	....	=25.8 per cent.

Elongation of inch sections: ″.24, ″.44*, ″.18, ″.21, ″.22.
Diameter at fracture, ″.60. Area, .283 square inch.
Contraction of area, 43.4 per cent.
Fractured 1″.34 from neck. Appearance, fibrous.

TABULATION OF TENSION SPECIMENS FROM COLD ROLLED IRON SHAFT.

No. of test.	Estimated annealing temperature.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation in 5 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch section.					Remarks.
	° Fahr.	Pounds.	Pounds.	Inches.	Per ct.	" Sq.in.	Per ct.		"	"	"	"	"	
4638	Not annealed	48,000	67,560	.68	13.6	Diam. .65=.332	33.6	Fibrous	.11,	.30*,	.11,	.09,	.07	Elastic limit, approximate.
4639	....do	47,000	67,320	.48	9.6	Diam. .65=.332	33.6	....do	.04,	.05,	.06,	.07,	.26*	Do.
4640	200	46,000	66,000	.65	13.0	Diam. .65=.332	33.6	....do	.09,	.31*,	.09,	.09,	.07	Annealed two hours.
4641	200	47,000	64,400	.78	15.6	Diam. .64=.322	35.6	....do	.08,	.14,	.35*,	.13,	.08	Do.
4642	300	49,000	64,100	.67	13.4	Diam. .64=.322	35.6	....do	.30*,	.13,	.10,	.08,	.06	Annealed two hours at 200°, and one and one-half hours at 300° Fahr.
4643	300	....	65,880	.71	14.2	Diam. .63=.312	37.6	....do	.07.	.10,	.10,	.20*,	.24*	
4644	400	49,000	65,040	.72	14.4	Diam. .64=.322	35.6	....do	.08,	.15,	.29*,	.10,	.10	
4645	567	49,000	63,940	.75	15.0	Diam. .63=.312	37,6	....do	.08,	.12.	.32*,	.14,	.09	
4646	1,095	38,000	53,580	1.14	22.8	Diam. .60=.283	43.4	....do	.21,	.43*,	.22,	.17,	.11	
4647	830	43,000	59,380	.73	14.6	Diam. .61=.292	41.6	....do	.07,	.18,	.33*,	.09,	.06	
4648	866	41,000	56,000	.84	16.8	Diam. .60=.283	43.4	....do	.09,	.11,	.12,	.15,	.37*	
4649	980	41,000	55,400	.96	19.2	Diam. .61=.292	41.6	....do	.10,	.15,	.16,	.36*,	.19	
4650	1,095	36,000	58,240	1.10	22.0	Diam. .60=.283	43.4	....do	.14,	.17,	.16,	.28,	.35*	
4651	1,115	38,000	50,640	1.08	21.6	Diam. .60=.283	43.4	....do	.11,	.15,	.18,	.40*,	.24	
4652	1,575	36,800	50,840	1.11	22.2	Diam. .59=.273	45.4	....do	.12,	.15,	.46*,	.24,	.14	Annealed four hours at 1,050°, then cooled and annealed at 1,575° Fahr.
4653	1,768	*20,000	48,940	1.40	28.0	Diam. .60=.283	43.4	....do	.21,	.32,	.45*,	.22.	.20	
4656	....	*20,000	53,180	1.08	21.6	Diam. .63=.312	37.6	Fibrous, trace of granulation.	.12,	.16,	.20,	.42*,	.18	Heated bright cherry red and quenched in brine.
4657	....	*20,000	51,420	1.29	25.8	Diam. .60=.283	43.4	Fibrous	.24,	.44*,	.18,	.21,	.22	Heated bright cherry red and quenched in oil.

* Below.

TEMPERATURE BARS.

TENSILE TESTS OF SPECIMENS BELONGING TO THE SECOND SERIES OF TEMPERATURE TEST BARS.

No. 4568.

STEEL BAR.

Mark, 12.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0007	0.	
2,500	10,000	.0017	....	
3,750	15,000	.0027	....	
5,000	20,000	.0037	.0	
6,250	25,000	.0049	....	
7,500	30,000	.0059	.0	
8,750	35,000	.0068	....	
10,000	40,000	.0079	.0001	
11,250	45,000	.0089	....	
12,500	50,000	.0100	.0001	
13,750	55,000	.0110	....	
15,000	60,000	.0121	.0001	
15,250	61,000	.0122	....	
15,500	62,000	.0124	....	
15,750	63,000	.0127	....	
16,000	64,000	.0129	....	
16,250	65,000	.0132	.0001	
16,500	66,000	.0134	....	
16,750	67,000	.0137	....	
17,000	68,000	.0139	....	
17,250	69,000	.0141	....	
17,500	70,000	.0143	.0001	Elastic limit.
17,750	71,000	.0146	....	
18,000	72,000	.0150	....	
18,250	73,000	.0157 .0300	....	
18,500	74,000	.0401	....	
18 750	75,000	.0438	....	
19,000	76,000	.0462	....	
19,500	78,000	.0538	....	
20,000	80,000	.0610	.0410	
20,500	82,000	.0670	....	
21,000	84,000	.0737	....	
21,500	86,000	.0804	....	
22,000	88,000	.0891	....	
22,500	90,000	.0968	....	
23,500	94,000	.115	....	
25,000	100,000	.135	....	
25,500	102,000	.145	....	
26,000	104,000	.160	....	
26,500	106,000	.170	....	
27,000	108,000	.185	....	
27,500	110,000	.205	....	
28,000	112,000	.220	....	
28,500	114,000	.230	....	
29,000	116,000	.245	....	
29,500	118,000	.26	....	
30,000	120,000	.28	....	
30,500	122,000	.30	....	
31,000	124,000	.33	....	
31,500	126,000	.38	....	
32,000	128,000	.43	....	
32,500	130,000	.53	....	
32,870	131,480	.71	....	Tensile strength.
0	0	.88	....	=14.7 per cent.

Elongation of inch sections: ″.11, ″.14, ″.15, ″.25*, ″.12, ″.11.
Diameter at fracture, ″.47. Area, .174 square inch.
Contraction of area, 30.4 per cent.
Fractured 3″ from neck. Appearance, fine granular, dull center.

No. 4569.

STEEL BAR.

Mark, 15.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	0.	
2,500	10,000	.0018	....	
5,000	20,000	.0039	....	
7,500	30,000	.0059	0.	
8,750	35,000	.0069	....	
10,000	40,000	.0081	0.	
11,250	45,000	.0090	....	
12,500	50,000	.0102	0.	
13,750	55,000	.0113	....	
15,000	60,000	.0124	.0001	
16,250	65,000	.0134	.0001	
17,000	68,000	.0143	....	Elastic limit.
17,250	69,000	.0149	....	
17,500	70,000	.0172	.0028	
17,750	71,000	.0338	....	
18,000	72,000	.0360	....	
18,250	73,000	.0371	....	
18,500	74,000	.0410	....	
19,000	76,000	.0455	....	
19,500	78,000	.0517	....	
20,000	80,000	.0585	.0378	
20,500	82,000	.0652	....	
21,000	84,000	.0688	....	
21,500	86,000	.0755	....	
22,000	88,000	.0822	....	
22,500	90,000	.0898	....	
23,000	92,000	.0955	....	
23,500	94,000	.1025	....	
24,000	96,000	.1100	....	
25,000	100,000	.13	....	
26,000	104,000	.15	....	
27,000	108,000	.17	....	
28,000	112,000	.19	....	
29,000	116,000	.21	....	
30,000	120,000	.24	....	
31,000	124,000	.28	....	
32,000	128,000	.32	....	
33,000	132,000	.41	....	
33,500	134,000	.50	....	
33,860	135,440	.61	....	Tensile strength.
0	0	.70	....	= 11.7 per cent.

Elongation of inch sections: ″.08, ″.10, ″.19*, ″.14, ″.10, ″.09.
Diameter at fracture, ″.48. Area, .181 square inch.
Contraction of area, 27.6 per cent.
Fractured at the middle of stem. Appearance, fine granular, dull center.

No. 4570.

STEEL BAR.

Mark, 18.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	0.	
2,500	10,000	.0018	....	
5,000	20,000	.0036	....	
7,500	30,000	.0056	....	
10,000	40,000	.0076	0.	
11,250	45,000	.0088	....	
12,500	50,000	.0098	....	
13,750	55,000	.0109	....	
15,000	60,000	.0121	.0001	
15,500	62,000	.0127	....	
16,000	64,000	.0132 .0340	....	Elastic limit.
16,250	65,000	.0398	.0223	
16,500	66,000	.0433	....	
17,000	68,000	.0465	....	
17,500	70,000	.0508	.0317	
18,000	72,000	.0578	....	
18,500	74,000	.0617	....	
19,000	76,000	.0654	....	
19,500	78,000	.0715	....	
20,000	80,000	.0765	.0531	
21.000	84,000	.08	....	
22,000	88,000	.09	....	
23,000	92,000	.11	....	
24,000	96,000	.14	....	
25,000	100,000	.16	....	
26.000	104,000	.17	....	
27,000	108,000	.19	....	
28.000	112,200	.21	....	
29,000	116,000	.24	....	
30,000	120,000	.26	....	
31,000	124,000	.31	....	
32,000	128,000	.37	....	
32,920	131,680	.57	....	Tensile strength.
0	0	.57	....	=9.5 per cent.

Elongation of inch sections: ″.10, ″.10, ″.09, ″.10, ″.09, ″.09.
Diameter at fracture, ″.52. Area, ″.212 square inch.
Contraction of area, 15.2 per cent.
Fractured 1″.10 from neck. Appearance, fine granular, radiating from center punch mark.

ENDURANCE OF ROTATING SHAFTS

FROM

STEEL, WROUGHT IRON, AND CAST IRON BARS.

ENDURANCE OF ROTATING SHAFTS.

The tests of rotating shafts for endurance under transverse stresses are continued from previous years.

Steel bars marked 15, 20, and 21 were from the second lot of steel for temperature tests. Steel bars marked S 8 were from the eighth rod of a lot of steel, specimens from seven rods having been tested and included in Report of 1890.

The test of cast iron bar No. 30 has been completed. This remarkable specimen made 47,283,500 rotations before rupture, and it appears that each rotation was accompanied by a decided permanent set in the metal.

Tension tests were made from a number of shafts to show the relation between the transverse stresses which ultimately caused rupture, and the tensile properties of the metal.

In order to obtain further data upon the phases of deterioration which the metal undergoes when subjected to alternate repeated stresses, the rotating tests of certain shafts were discontinued before rupture occurred, and from these shafts specimens were taken and tested by tension.

Inasmuch as the maximum stresses are confined to the exterior metal at the middle of the length of the shaft where the loads were applied, it was decided to test annular specimens taken from this middle section in comparison with specimens of similar form taken from the outer end of the shaft, where the metal in the latter case had not been exposed to excessive bending stresses.

A comparison was made between annular and solid specimens from a steel bar 1″ diameter, which indicated that nearly the same strength was shown by the two types of specimens. The result of these two tests precede the regular tests of the endurance series.

In the annular specimens from the middle of the endurance shafts it was of course intended to test only the metal which had been exposed to nearly or quite the maximum stresses. The specimens were consequently bored out, leaving a thickness of only one-sixteenth of an inch of metal.

The results were as follows:

SHAFTS FROM STEEL BAR NO. 8.

Endurance record.			Tensile strength per square inch of annular specimens from—				Remarks.
Number.	Fiber stress per square inch.	Number of rotations.	Middle of shaft.	End of shaft.	Gain or loss of middle specimen.		
					Gain.	Loss.	
	Pounds.		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	
130	30,000 and 40,000	173,400	....	....	....	....	Endurance shaft ruptured.
131	40,000	100,000	67,070	64,240	2,830	....	
132	40,000	87,900	67,070	61,000	6,070	....	
133	40,000	60,000	91,630	60,770	30,860	....	
134	40,000	124,000	64,620	61,120	3,500	....	

Cold Rolled Iron Shafts.

Endurance record.			Tensile strength per square inch of annular specimens from—				Remarks.
Number.	Fiber stress per square inch.	Number of rotations.	Middle of shaft.	End of shaft.	Gain or loss of middle specimen.		
					Gain.	Loss.	
	Pounds.		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	
137	40,000	325,300	....	....	....	....	Endurance shaft ruptured.
138	40,000	250,000	53,750	73,420	....	19,670	
139	40,000	150,000	62,610	72,390	....	9,780	
140	45,000	192,500					Endurance shafts ruptured.
141	45,000	116,500	....	....	....	....	
142	45,000	125,000	34,620	69,620	....	35,000	
143	45,000	80,000	57,720	71,960	....	14,240	
144	45,000	40,000	70,540	68,640	1,900	....	
145	50.000	47,050	....	....	....	....	
146	50,000	40,000	56,000	66,850	....	10,850	Endurance shaft ruptured.
147	50,000	20,000	65,430	68,000	....	2,570	
148	50,000	5,000	61,000	64,000	....	3,000	

In the case of the steel bar tested by repeated stresses, 40,000 pounds per square inch fiber stress ultimately caused rupture.

The annular tensile specimens taken from the other endurance shafts not carried to rupture in the rotating tests, show the metal stronger in each instance at the middle over the end specimens.

In this behavior we note a similarity in effect to that of other cold working, in raising the tensile strength at least for a time, and it suggests the probability that metal generally passes through a stage of increased tensile resistance before its final rupture under apparently diminished loads; or, stated in another manner, that ordinary hot worked metal is not left in its state of greatest tensile resistance, and that while repeated alternate stresses below the ordinarily accepted tensile strength eventually causes rupture, the metal at an intermediate stage passes through a state of increased resistance.

We are not certain when final rupture occurs that the parts first to rupture are not at the time in a state of maximum resistance, and the apparent loss in strength may be due to the accumulation of internal strains or some other cause not yet recognized.

The cold rolled iron annular specimens, with one exception, showed lower strength at the middle than the end specimens.

While the data are insufficient to explain conclusively these results, yet they are suggestive, and lead to the conjecture that as we have in the cold rolled iron the metal already in a state of increased resistance, approaching the maximum, additional working under repeated stresses would tend to lower its apparent strength.

The total number of rotations necessary to cause rupture differs widely in specimens nominally of the same grade of metal exposed to similar conditions of loading.

For further investigation of these phenomena it is purposed to continue the test with annular specimens from shafts exposed to different fiber stresses and after different periods of rotation, establishing more points in the curve of apparent strength as modified by total fiber stress and repetitions of load.

Also to anneal and then test other annular specimens from overloaded shafts, to determine the question of permanency in the modified strength of the metal. These tests, it is believed, will furnish data upon the influence of accumulated internal strains in promoting rupture, and data relating to the complete or partial effacement of the effects of overstraining at different stages prior to complete rupture.

Tensile tests of two specimens from a steel bar 1″ diameter, to show comparative strength of a solid cylindrical and an annular specimen.

No. 4733.

SOLID CYLINDER.

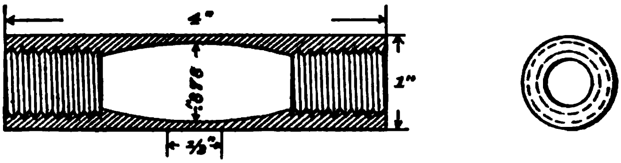
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	0.	
2,500	10,000	.0011	....	
5,000	20,000	.0021	....	
7,500	30,000	.0031	0.	
8,750	35,000	.0037	....	
10,000	40,000	.0043	.0001	
11,250	45,000	.0048	....	
11,500	46,000	.0049	....	Elastic limit; load fell.
10,000	40,000	.0110	....	
10,250	41,000	.0130	....	
10,500	42,000	.0220	....	
10,750	43,000	.0860	....	
11,000	44,000	.0905	....	
11,250	45,000	.0963	....	
11,500	46,000	.1080	....	
11,750	47,000	.1155	....	
12,000	48,000	.1241	....	
12,250	49,000	.1340	....	
12,500	50,000	.1458	....	
13,000	52,000	.17	....	
13,500	54,000	.21	....	
14,000	56,000	.26	....	
14,500	58,000	.31	....	
15,000	60,000	.41	....	
15,500	62,000	.64	....	Tensile strength.
0	0	1.07	....	= 35.7 per cent.

Elongation of inch sections, ″.22, ″.34*, ″.51*.
Diameter at fracture, ″.32; area, .080 square inch.
Contraction of area, 68.0 per cent.
Fractured 1″.4 from neck. Appearance, fine silky.

No. 4734.

ANNULAR SPECIMEN.



Sectional area, .180 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
180	1,000	0.	0.	Initial load.
900	5,000	.0001	....	
1,800	10,000	.0003	....	
3,600	20,000	.0012	—.0001	
4,500	25,000	.0018	....	
5,400	30,000	.0023	—.0001	
6,300	35,000	.0029	....	
7,200	40,000	.0040	.0005	
7,380	41,000	.0138	....	
7,560	42,000	.0221	....	
7,740	43,000	.0279	....	
7,920	44,000	.0520	....	
8,100	45,000	.0643	....	
8,280	46,000	.0700	....	
8,460	47,000	.0748	....	
8,640	48,000	.0820	....	
8,820	49,000	.0905	....	
9,000	50,000	.0995	....	
10,980	61,000	....	....	Tensile strength.

Appearance of fracture, silky.

No. 122.

STEEL BAR. MARKS, 15.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2002	.1700	.2002	.0302	0.	
			b	.2005	.1703	.2005	.0302	0.	
			c	.2004	.1701	.2003	.0302	.0001	
	10,000	10,000	*a*	.2002	.1701	.2002	.0301	0.	
			b	.2005	.1703	.2005	.0302	0.	
			c	.2004	.1702	.2003	.0301	.0001	
	40,000	50,000	*a*	.2002	.1702	.2002	.0300	0.	
			b	.2005	.1703	.2005	.0302	0.	
			c	.2003	.1701	.2003	.0302	0.	
	50,000	100,000	*a*	.2003	.1703	.2002	.0299	.0001	
			b	.2005	.1702	.2004	.0302	.0001	
			c	.2004	.1701	.2003	.0303	.0001	
	100,000	200,000	*a*	.2003	.1700	.2002	.0302	.0001	
			b	.2005	.1702	.2004	.0302	.0001	
			c	.2004	.1701	.2003	.0302	.0001	
	100,000	300,000	*a*	.2003	.1699	.2002	.0303	.0001	
			b	.2005	.1702	.2005	.0303	0.	
			c	.2004	.1700	.2004	.0304	0.	
	205,000	505,000	*a*	.2003	.1698	.2002	.0304	.0001	
			b	.2005	.1701	.2004	.0303	.0001	
			c	.2003	.1699	.2003	.0304	0.	
	195,000	700,000	*a*	.2002	.1700	.2002	.0302	0.	
			b	.2005	.1702	.2005	.0303	0.	
			c	.2004	.1700	.2003	.0303	.0001	

No. 122—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
	300,000	1,000,000	*a*	.2002	.1698	.2002	.0304	0.	
			b	.2005	.1702	.2005	.0303	0.	
			c	.2003	.1700	.2003	.0303	0.	
	1,000,000	2,000,000	*a*	.2003	.1702	.2002	.0300	.0001	
			b	.2006	.1702	.2005	.0303	.0001	
			c	.2004	.1702	.2004	.0302	0.	
	1,002,000	3,002,000	*a*	.2002	.1698	.2002	.0304	0.	
			b	.2005	.1701	.2005	.0304	0.	
			c	.2004	.1699	.2004	.0305	0.	
	1,006,000	4,008,000	*a*	.2001	.1697	.2001	.0304	0.	
			b	.2005	.1702	.2005	.0303	0.	
			c	.2002	.1702	.2002	.0300	0.	
	992,000	5,000,000	*a*	.2003	.1699	.2003	.0304	0.	
			b	.2006	.1702	.2006	.0304	0.	
			c	.2005	.1701	.2004	.0303	.0001	
	1,005,500	6,005,500	*a*	.2004	.1703	.2004	.0301	0.	
			b	.2007	.1704	.2006	.0302	.0001	
			c	.2005	.1701	.2004	.0303	.0001	
	570,900	6,576,400	....	....	....	....	....	....	Bar ruptured.

No. 121.

STEEL BAR. MARKS, 20.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1990	.1695	.1990	.0295	0	
			b	.1990	.1695	.1990	.0295	0	
			c	.1994	.1699	.1992	.0298	.0002	
	10,000	10,000	*a*	.1986	.1690	.1986	.0296	0	
			b	.1992	.1698	.1987	.0294	.0005	
			c	.1995	.1696	.1989	.0298	.0006	
	146,700	156,700	*a*	.1965	.1665	.1965	.0300	0	
			b	.2001	.1677	.1978	.0301	.0023	
			c	.2010	.1681	.1982	.0301	.0028	
	348,940	565,640	*a*	.2913	.1696	.1994	.0298	.0019	
			b	.1982	.1672	.1978	.0301	.0009	
			c	.1997	.1680	.1981	.0301	.0016	
	840,560	846,200	....	....	....	....	....	....	Bar ruptured.

No. 120.

STEEL BAR. MARKS, 21.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2006	.1709	.2004	.0296	.0002	
			b	.2008	.1711	.2006	.0295	.0002	
			c	.2011	.1714	.2010	.0296	.0001	
	10,000	10,000	*a*	.2004	.1704	.2002	.0298	.0002	
			b	.2012	.1707	.2004	.0297	.0008	
			c	.2013	.1707	.2006	.0299	.0007	
	40,600	50,000	*a*	.2008	.1685	.1990	.0305	.0018	
			b	.2025	.1688	.1995	.0307	.0030	
			c	.2018	.1689	.1995	.0306	.0023	
	150,000	200,000	*a*	.1972	.1658	.1970	.0312	.0002	
			b	.2010	.1668	.1980	.0312	.0030	
			c	.2039	.1677	.1989	.0312	.0050	Bar acquired temperature of about 110° Fahr. while running.
	300,000	500,000	*a*	.2014	.1664	.1978	.0314	.0036	
			b	.2035	.1670	.1985	.0315	.0050	
			c	.2027	.1673	.1985	.0312	.0042	
	266,000	766,000	....	....	....	....	....	....	Bar ruptured.

No. 130.

Steel Bar. Marks, S 8.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	0	0	*a*	.1997	.1777	.1996	.0219	.0001	
			b	.1997	.1776	.1996	.0220	.0001	
			c	.1997	.1776	.1997	.0221	0	
	12,000	12,000	*a*	.1993	.1769	.1993	.0224	0	
			b	.1998	.1778	.1998	.0220	0	
			c	.1997	.1773	.1994	.0221	.0003	
35,000	0	12,000	*a*	.1994	.1734	.1993	.0259	.0001	
			b	.1898	.1743	.1997	.0254	.0001	
			c	.1994	.1737	.1993	.0256	.0001	
	28,000	40,000	*a*	.1989	.1729	.1988	.0259	.0001	
			b	.2002	.1738	.1997	.0259	.0005	
			c	.1996	.1733	.1993	.0260	.0003	
40,000	0	40,000	*a*	.1995	.1693	.1989	.0296	.0006	
			b	.2003	.1702	.1996	.0294	.0007	
			c	.1993	.1697	.1889	.0292	.0004	
	23,000	63,000	*a*	.2007	.1685	.1983	.0298	.0024	
			b	.2006	.1693	.1992	.0299	.0014	
			c	.2002	.1683	.1982	.0299	.0020	
	110,400	173,400							Bar ruptured.

No. 131.

STEEL BAR. MARKS S 8.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1997	.1690	.1987	.0297	.0010	
			b	.1993	.1691	.1987	.0296	.0006	
			c	.2004	.1706	.2002	.0296	.0002	
	100,000	100,000	*a*	.1932	.1632	.1932	.0300	0	
			b	.2013	.1696	.1994	.0298	.0019	
			c	.2033	.1717	.2013	.0296	.0020	Test discontinued.

No. 132.

STEEL BAR. MARKS, S 8.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1996	.1702	.1997	.0295	—.0001	
			b	.2002	.1705	.1998	.0293	.0004	
			c	.1993	.1699	.1992	.0293	.0001	
	87,900	87,900	*a*	.1988	.1682	.1985	.0303	.0003	
			b	.2011	.1687	.1989	.0302	.0022	
			c	1.986	.1689	.1986	.0297	0	Test discontinued.

No. 133.

STEEL BAR. MARKS, S 8.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1991	.1696	.1990	.0294	.0001	
			b	.1995	.1695	.1993	.0298	.0002	
			c	.1997	.1700	.1996	.0296	.0001	
	60,000	60,000	*a*	.1977	.1675	.1975	.0300	.0062	
			b	.2009	.1690	.1987	.0297	.0022	
			c	.2005	.1686	.1985	.0299	.0020	Test discontinued.

No. 134.

STEEL BAR. MARKS, S 8.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2001	.1699	.1999	.0300	.0002	
			b	.2000	.1700	.1999	.0299	.0001	
			c	.2001	.1700	.1999	.0299	.0002	
	124,000	124,000	*a*	.2060	.1691	.1989	.0298	.0011	
			b	.1994	.1684	.1984	.0300	.0010	
			c	.2015	.1689	.1991	.0302	.0024	Test discontinued.

No. 123.

COLD ROLLED IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1998	.1681	.1996	.0315	.0002	
			b	.2010	.1692	.2007	.0315	.0008	
			c	.1990	.1673	.1989	.0316	.0001	
	10,000	10,000	*a*	.1998	.1681	.1996	.0315	.0002	
			b	.2009	.1689	.2006	.0317	.0003	
			c	.1992	.1670	.1989	.0319	.0003	
	40,000	50,000	*a*	.2000	.1677	.1995	.0318	.0005	
			b	.2008	.1686	.2004	.0318	.0004	
			c	.1994	.1668	.1988	.0320	.0006	
	50,000	100,000	*a*	.1993	.1676	.1993	.0317	0.	
			b	.2014	.1688	.2005	.0317	.0008	
			c	.1998	.1670	.1989	.0319	.0009	
	109,500	209,500	*a*	.2002	.1676	.1995	.0319	.0007	
			b	.2016	.1688	.2006	.0318	.0010	
			c	.1994	.1670	.1988	.0318	.0006	
	90,800	300,300	*a*	.2000	.1673	.1993	.0320	.0007	
			b	.2017	.1685	.2004	.0319	.0013	
			c	.1998	.1670	.1989	.0319	.0009	
	99,700	400,000	....	....	....	....	....	....	Scored at middle bearing.
	85,000	485,500	....	....	....	....	....	....	Bar ruptured.

No. 124.

COLD ROLLED IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Icnh.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2002	.1681	.1999	.0318	.0003	
			b	.2002	.1683	.1999	.0316	.0003	
			c	.1997	.1676	.1993	.0317	.0004	
	10,000	10,000	*a*	.2003	.1680	.1998	.0318	.0005	
			b	.2003	.1682	.1999	.0317	.0004	
			c	.1996	.1675	.1993	.0318	.0003	
	40,000	50,000	*a*	.2004	.1682	.1999	.0317	.0005	
			b	.2003	.1682	.1998	.0316	.0005	
			c	.1995	.1672	.1991	.0319	.0004	
	50,000	100,000	....	....	....	....	....	....	Scored at middle bearing.
	198,800	298,800	....	....	....	....	....	....	Bar ruptured.

No. 125.

COLD ROLLED IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2001	.1683	.1999	.0316	.0002	
			b	.1994	.1675	.1992	.0317	.0002	
			c	.2008	.1685	.2005	.0320	.0003	
	10,500	10,500	*a*	.2001	.1682	.1997	.0315	.0004	
			b	.1994	.1674	.1992	.0318	.0002	
			c	.2009	.1686	.2005	.0319	.0004	
	40,200	50,700	*a*	.2005	.1678	.1996	.0318	.0009	
			b	.1996	.1674	.1991	.0317	.0005	
			c	.2009	.1685	.2004	.0319	.0005	
	49,300	100,000	*a*	.1999	.1678	.1994	.0316	.0005	
			b	.2000	.1673	.1992	.0319	.0008	
			c	.2010	.1684	.2003	.0319	.0007	
	218,500	318,500	....	....	....	....	....	....	Bar ruptured.

No. 126.

COLD ROLLED IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	0	0	*a*	.2012	.1772	.2010	.0238	.0002	
			b	.1996	.1756	.1994	.0238	.0002	
			c	.1992	.1754	.1992	.0238	0.	
	10,000	10,000	*a*	.2012	.1772	,2010	.0238	.0002	
			b	.1997	.1758	.1994	.0236	.0003	
			c	.1996	.1756	.1994	.0238	.0002	
	40,000	50,000	*a*	.2014	.1771	.2012	.0241	.0002	
			b	.1997	.1756	.1994	.0238	.0003	
			c	.1996	.1755	.1993	.0238	.0003	
	50,000	100,000	*a*	.2013	.1771	.2010	.0239	.0003	
			b	.1997	.1757	.1994	.0237	.0003	
			c	.1995	.1755	.1993	.0238	.0002	
	400,000	500,000	....	....	....	....	....	....	Scored at middle bearing.
	4,520,000	5,020,000	....	....	....	....	....	....	Indication of crack. Diameter of bar at bearing reduced ″.01.
	31,700	5,051,700	....	....	....	....	....	....	Bar ruptured ⅜″ from edge of bearing.

No. 127.

COLD ROLLED IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	0	0	*a*	.1999	.1760	.1997	.0237	.0002	
			b	.2001	.1760	.1999	.0239	.0002	
			c	.1998	.1757	.1995	.0238	.0003	
	10,000	10,000	*a*	.1998	.1762	.1998	.0236	0.	
			b	.2007	.1765	.2004	.0239	.0003	
			c	.1998	.1758	.1995	.0237	.0003	
	40,000	50,000	*a*	.1998	.1758	.1998	.0240	0.	
			b	.2008	.1766	.2005	.0239	.0003	
			c	.1998	.1758	.1995	.0237	.0003	
	50,000	100,000	*a*	.2002	.1764	.2001	.0237	.0001	
			b	.2015	.1775	.2012	.0237	.0003	
			c	.2002	.1762	.1999	.0237	.0003	
									Middle bearing slightly scored.
	1,530,000	1,630,000	....	....	....	....	....	....	Indication of crack.
	8,600	1,638,600	....	....	....	....	....	....	Bar ruptured.

No. 128.

Cold Rolled Iron Bar. No. 2.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2009	.1607	.2008	.0401	.0001	
			b	.2010	.1608	.2007	.0399	.0003	
			c	.2004	.1604	.2001	.0397	.0003	
	10,000	10,000	*a*	.2030	.1593	.1996	.0403	.0034	Gradual increase of temperature.
			b	.2027	.1592	.1996	.0404	.0031	
			c	.2013	.1587	.1984	.0397	.0029	
	37,700	47,700	....	....	....	....	....	....	Bar ruptured. The middle bearing was scored, and temperature of bar had increased to 150° Fahr.

No. 129.

Cold Rolled Iron Bar. No. 2.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2015	.1616	.2013	.0397	.0002	
			b	.2002	.1602	.1999	.0397	.0003	
			c	.2006	.1610	.2004	.0394	.0002	
	10,000	10,000	*a*	.1992	.1591	.1991	.0400	.0001	Gradual increase of temperature.
			b	.2017	.1590	.1991	.0401	.0026	
			c	.2021	.1600	.1994	.0394	.0027	
	46,200	56,200	....	....	....	....	....	....	Bar ruptured. The middle bearing was scored, and temperature of bar had increased to 150° Fahr.

No. 137.

COLD ROLLED IRON BAR. No. 2.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2011	.1692	.2008	.0316	.0003	
			b	.2004	.1680	.2002	.0313	.0002	
			c	.2007	.1688	.2004	.0316	.0003	
	100,000	100,000	*a*	.2009	.1693	.2008	.0315	.0001	
			b	.2002	.1686	.2000	.0314	.0002	
			c	.2011	.1689	.2005	.0316	.0006	
	225,300	325,300	....	....	....	....	....	....	Bar ruptured.

No. 138.

COLD ROLLED IRON BAR. No. 2.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflection.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2017	.1699	.2015	.0316	.0002	
			b	.2002	.1686	.2001	.0315	.0001	
			c	.2007	.1692	.2005	.0313	.0002	
	100,000	100,000	*a*	.2012	.1693	.2012	.0319	0	
			b	.2004	.1683	.2000	.0317	.0004	
			c	.2010	.1689	.2003	.0314	.0007	
	150,000	250,000	*a*	.2014	.1688	.2010	.0322	.0004	
			b	.2008	.1684	.2000	.0316	.0008	
			c	.2005	.1685	.2001	.0316	.0004	Test discontinued.

No. 139.

COLD ROLLED IRON BAR. No. 2.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2009	.1693	.2007	.0314	.0002	
			b	.2002	.1686	.1999	.0313	.0003	
			c	.2010	.1690	.2008	.0318	.0002	
	100,000	100,000	*a*	.2015	.1694	.2010	.0316	.0005	
			b	.2004	.1688	.2002	.0314	.0002	
			c	.2011	.1690	.2008	.0318	.0003	
	50,000	150,000	*a*	.2009	.1692	.2005	.0313	.0004	
			b	.2005	.1685	.1999	.0314	.0006	
			c	.2014	.1692	.2009	.0317	.0005	Test discontinued.

No. 140.

COLD ROLLED IRON BAR. No. 3.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.1990	.1638	.1987	.0349	.0003	
			b	.2014	.1660	.2010	.0350	.0004	
			c	.2002	.1647	.1998	.0351	.0004	
	56,000	56,000	*a*	.1974	.1620	.1974	.0354	0.	
			b	.2025	.1661	.2014	.0353	.0011	
			c	.2021	.1656	.2008	.0352	.0013	
	136,500	192,500							Bar ruptured.

No. 141.

COLD ROLLED IRON BAR. No. 3.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2009	.1655	.2006	.0351	.0003	
			b	.1983	.1630	.1981	.0351	.0002	
			c	.2010	.1655	.2007	.0352	.0003	
	40,000	40,000	*a*	.2013	.1646	.2000	.0354	.0013	
			b	.2001	.1622	.1972	.0350	.0029	
			c	.2015	.1644	.2000	.0354	.0015	
	76,500	116,500	....	....	....	....	....	....	Bar ruptured.

No. 142.

COLD ROLLED IRON BAR. No. 3.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2001	.1646	.1999	.0353	.0002	
			b	.2008	.1654	.2006	.0352	.0002	
			c	.2000	.1643	.1996	.0353	.0004	
	100,000	100,000	*a*	.1995	.1632	.1987	.0355	.0008	
			b	.1995	.1629	.1983	.0354	.0012	
			c	.2020	.1624	.1985	.0361	.0035	
	25,000	125,000	*a*	.2031	.1642	.2005	.0363	.0026	
			b	.1985	.1620	.1978	.0358	.0007	
			c	.2010	.1610	.1986	.0376	.0024	Test discontinued.

No. 143.

COLD ROLLED IRON BAR. No. 3.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.1983	.1628	.1980	.0352	.0003	
			b	.2011	.1657	.2009	.0352	.0002	
			c	.2002	.1645	.1999	.0354	.0003	
	80,000	80,000	*a*	.1958	.1606	.1957	.0351	.0001	
			b	.2027	.1642	.1996	.0354	.0031	
			c	.2019	.1640	.1995	.0355	.0024	Test discontinued.

No. 144.

COLD ROLLED IRON BAR. No. 3.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2000	.1645	.1999	.0354	.0001	
			b	.1993	.1641	.1990	.0349	.0003	
			c	.2010	.1650	.2008	.0352	.0002	
	40,000	40,000	*a*	.2008	.1640	.1994	.0354	.0014	
			b	.2007	.1631	.1982	.0351	.0025	
			c	.2015	.1649	.2002	.0353	.0013	Test discontinued.

No. 145.

COLD ROLLED IRON BAR. No. 4.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2008	.1610	.2005	.0395	.0003	
			b	.2000	.1607	.1997	.0390	.0003	
			c	.2019	.1620	.2015	.0395	.0004	
	47,050	47,050	....	....	....	....	....	....	Bar ruptured.

No. 146.

COLD ROLLED IRON BAR. No. 4.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2002	.1606	.2000	.0394	.0002	
			b	.2014	.1623	.2012	.0389	.0002	
			c	.1998	.1604	.1997	.0393	.0001	
	40,000	40,000	*a*	.2076	.1616	.2015	.0399	.0061	
			b	.2010	.1596	.1991	.0395	.0011	
			c	.1990	.1574	.1973	.0399	.0017	Test discontinued.

No. 147.

COLD ROLLED IRON BAR. No. 4.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2011	.1618	.2009	.0391	.0002	
			b	.2014	.1620	.2012	.0392	.0002	
			c	.1993	.1596	.1990	.0394	.0003	
	20,000	20,000	*a*	.2006	.1588	.1984	.0396	.0022	
			b	.2007	.1586	.1981	.0395	.0026	
			c	.2027	.1585	.1981	.0396	.0046	Test discontinued.

No. 148.

COLD ROLLED IRON BAR. No. 4.

Diameter, 1''. Speed of rotation, 400 per minute. Length between end bearings, 33''. Deflections measured on chord of 10''.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2009	.1611	.2006	.0395	.0003	
			b	.2005	.1612	.2002	.0390	.0003	
			c	.2009	.1614	.2007	.0393	.0002	
	5,000	5,000	*a*	.1975	.1578	.1974	.0396	.0001	
			b	.2005	.1578	.1971	.0393	.0034	
			c	.2043	.1598	.1995	.0397	.0048	Test discontinued.

No. 135.

WROUGHT IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.1988	.1726	.1985	.0259	.0003	
			b	.1986	.1726	.1985	.0259	.0001	
			c	.1989	.1728	.1988	.0260	.0001	
	1,004,000	1,004,000	*a*	.1989	.1728	.1987	.0259	.0002	
			b	.1987	.1726	.1985	.0259	.0002	
			c	.1989	.1729	.1988	.0259	.0001	
	189,160	1,193,160	....	....	....	....	....	....	Bar ruptured.

No. 136.

WROUGHT IRON BAR. No. 1.

Diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 33″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.1998	.1737	.1997	.0260	.0001	
			b	.1998	.1737	.1997	.0260	.0001	
			c	.1997	.1738	.1966	.0260	.0001	Middle bearing cut.
	372,085	372,085	....	....	....	....	....	....	Test discontinued.

No. 30.

CAST (GUN) IRON BAR. No. 4.

Original diameter, 1″. Speed of rotation, 400 per minute. Length between end bearings, 38″. Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
15,000	....	37,277,000	....	....	....	....	....	.0008	Removed from machine and rested 14 months. Middle bearing reduced by wear to ″.995. Test resumed.
15,000	0	37,277,000	*a*	.2015	.1820	.2010	.0190	.0005	
			b	.2016	.1819	.2009	.0190	.0007	
			c	.2010	.1813	.2004	.0191	.0006	
	10,000	37,287,000	*a*	.2016	.1819	.2010	.0191	.0006	
			b	.2017	.1820	.2009	.0189	.0008	
			c	.2010	.1813	.2004	.0191	.0006	
	9,996,500	47,283,500	....	....	....	....	....	....	Diameter worn down to ″.993. Bar ruptured.

Chemical composition.

Total carbon	2.524	Silicon	1.059
Graphitic carbon	1.998	Sulphur	0.070
Combined carbon	0.526	Phosphorus	0.432
Manganese	0.385	Copper	0.006

ENDURANCE OF ROTATING SHAFTS.

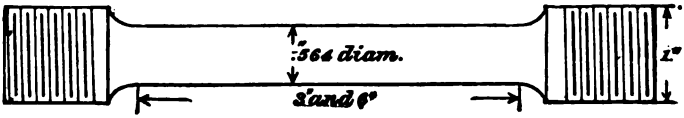
SUMMARIZED TABULATION.

No of test.	Material.	Marks.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Number of rotations.		Remarks.
					Successive.	Total.	
				Pounds.			
123	Steel	15	400	40,000	6,576,400	6,576,400	Bar ruptured.
121	do	20	400	40,000	846,200	846,200	Do.
120	do	21	400	40,000	766,000	766,000	Do.
130	do	S 8	400	30,000	12,000	12,000	
				35,000	28,000	40,000	
				40,000	133,400	173,400	Do.
131	do	S 8	400	40,000	100,000	100,000	Test discontinued.
132	do	S 8	400	40,000	87,900	87,900	Do.
133	do	S 8	400	40,000	60,000	60,000	Do.
134	do	S 8	400	40,000	124,000	124,000	Do.
123	Cold rolled iron	1	400	40,000	485,000	485,000	Bar ruptured.
124	do	1	400	40,000	293,800	293,800	Do.
125	do	1	400	40,000	318,500	318,500	Do.
126	do	1	400	30,000	5,051,700	5,051,700	Bar ruptured ⅜" from edge of bearing.
127	do	1	400	30,000	1,638,600	1,638,600	Bar ruptured.
128	do	2	400	50,000	47,700	47,700	Do.
129	do	2	400	50,000	56,200	56,200	Do.
137	do	2	400	40,000	325,300	325,300	Do.
138	do	2	400	40,000	250,000	250,000	Test discontinued.
139	do	2	400	40,000	150,000	150,000	Do.
140	do	3	400	45,000	192,500	192,500	Bar ruptured.
141	do	3	400	45,000	116,500	116,500	Do.
142	do	3	400	45,000	125,000	125,000	Test discontinued.
143	do	3	400	45,000	80,000	80,000	Do.
144	do	3	400	45,000	40,000	40,000	Do.
145	do	4	400	50,000	47,050	47,050	Bar ruptured.
146	do	4	400	50,000	40,000	40,000	Test discontinued.
147	do	4	400	50,000	20,000	20,000	Do.
148	do	4	400	50,000	5,000	5,000	Do.
135	Wrought iron	1	400	35,000	1,193,160	1,193,160	Bar ruptured.
136	do	1	400	35,000	372,085	372,085	Test discontinued. Middle bearing cut.
30	Cast (gun) iron		400	15,000	37,151,900	37,151,900	Rested 8 months.
			22.00	15,000	125,100	37,277,000	Rested 14 months.
			400	15,000	9,906,500	47,283,500	Bar ruptured.

TENSION SPECIMENS

FROM

RUPTURED ENDURANCE SHAFTS.



STEEL.

No. 4561.

Specimen from outer end of endurance shaft No. 120.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

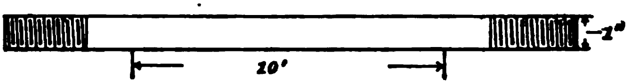
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0005	0.	
2,500	10,000	.0015	....	
3,750	15,000	.0025	....	
5,000	20,000	.0035	....	
6,250	25,000	.0044	....	
7,500	30,000	.0054	0.	
8,750	35,000	.0063	....	
10,000	40,000	.0073	0.	
11,250	45,000	.0083	0.	
12,500	50,000	.0093	0.	
13,750	55,000	.0103	0.	
15,000	60,000	.0114	0.	
16,250	65,000	.0125	0.	
16,500	66,000	.0128	....	
16,750	67,000	.0130	....	
17,000	68,000	.0131	....	
17,250	69,000	.0132	....	Elastic limit.
17.500	70,000	.0134	....	
17,500	70,000	.0659	....	Second application of load after release and no set shown.
17,750	71,000	.0672	....	
18,000	72,000	.0688	....	
18.250	73,000	.0708	....	
18,500	74,000	.0736	....	
18,750	75,000	.0758	.0536	
19,000	76,000	.0800	....	
19,250	77,000	.0815	....	
19,500	78,000	.0830	....	
19,750	79,000	.0851	....	
20,000	80,000	.0893	.0651	
22,500	90,000	.12	....	
25,000	100.000	.16	....	
27,500	110,000	.22	....	
28,750	115,000	.25	....	
30,000	120,000	.33	....	
31,250	125,000	.50	....	
31,310	125,240	....	....	Tensile strength.
0	0	.54	....	= 9.0 per cent.

Elongation of inch sections, ″.07, ″.07, ″.08, ″.09, ″.12, ″.11*.
Diameter at fracture, ″.53: Area, .221 square inch.
Contraction of area, 11.6 per cent.
Fractured at neck, at punch mark. Appearance, fine granular.

STEEL.

No. 4563.

Specimen from outer end of endurance shaft No. 120.



Diameter, 1″.
Sectional area, .7854 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
785	1,000	0.	0.	Initial load.
3,927	5,000	.0012	....	
7,854	10,000	.0029	....	
11,781	15,000	.0046	....	
15,608	20,000	.0061	....	
19,535	25,000	.0079	....	
23,462	30,000	.0096	....	
27,389	35,000	.0112	....	
31,316	40,000	.0130	....	
35,243	45,000	.0148	....	
39,170	50,000	.0162	....	
		.0162	.0001	After sustaining load 5 minutes.
43,097	55,000	.0180	.0001	
47,024	59,870	.0199	.0001	Fractured at root of thread. Appearance, fine granular.

STEEL.

No. 4562.

Specimen from outer end of endurance shaft No. 121.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0008	0.	
2,500	10,000	.0018	....	
5,000	20,000	.0038	....	
7,500	30,000	.0057	0.	
8,750	35,000	.0066	....	
10,000	40,000	.0076	0.	
11,250	45,000	.0086	....	
12,500	50,000	.0098	0.	
13,750	55,000	.0108	....	
15,000	60,000	.0118	0.	
16,250	65,000	.0128	0.	
16,500	66,000	.0130	....	
16,750	67,000	.0131	....	
17,000	68,000	.0133	....	
17,250	69,000	.0135	....	
17,500	70,000	.0138	0.	
17,750	71,000	.0141	....	Elastic limit.
				Load fell.
16,750	67,000	.0215	....	
17,000	68,000	.0233	....	
17,250	69,000	.0349	....	
17,500	70,000	.0599	....	
17,750	71,000	.0603	....	
18,000	72,000	.0620	....	
18,250	73,000	.0640	....	
18,500	74,000	.0660	....	
18,750	75,000	.0691	.0476	
19,000	76,000	.0732	....	
19,500	78,000	.0772	....	
20,000	80,000	.0813	....	
20,500	82,000	.0868	....	
21,000	84,000	.0910	....	
21,500	86,000	.0970	....	
22,000	88,000	.1010	....	
22,500	90,000	.1080	....	
25,000	100,000	.15	....	
27,500	110,000	.19	....	
28,750	115,000	.23	....	
30,000	120,000	.28	....	
31,250	125,000	.35	....	
32,210	128,840	....	....	Tensile strength.
0	0	.44	....	= 7.3 per cent.

Elongation of inch sections: ″.07, ″.08, ″.08, ″.07, ″.07*, ″.07*.
Diameter at fracture, ″.54. Area, .229 square inch.
Contraction of area, 8.4 per cent.

Fractured 1.07 from the neck, at center punch mark. Appearance, fine granular.

STEEL.

No. 4568.

Specimen from outer end of endurance shaft No. 121.
Same form as No. 4563.
Diameter, 1″.
Sectional area, .7854 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
785	1,000	0.	0.	Initial load.
3,927	5,000	.0011	0.	
7,854	10,000	.0030	0.	
11,781	15,000	.0046	....	
15,708	20,000	.0062	....	
19,635	25,000	.0080	....	
23,562	30,000	.0098	0.	
27,489	35,000	.0112	....	
31,416	40,000	.0131	0.	
39,270	50,000	....	0.	Test discontinued.

COLD ROLLED IRON.

No. 4564.

Specimen from outer end of endurance shaft No. 123.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	0.	
2,500	10,000	.0020	....	
3,750	15,000	.0030	....	
5,000	20,000	.0040	.0001	
6,250	25,000	.0051	....	
7,500	30,000	.0062	.0001	
8,750	35,000	.0072	.0002	
10,000	40,000	.0082	.0002	
11,250	45,000	.0093	.0002	
12,000	48,000	.0103	....	
12,250	49,000	.0107	....	
12,500	50,000	.0110	.0009	
12,750	51,000	.0114	....	
13,000	52,000	.0121	....	
13,250	53,000	.0128	....	
13,500	54,000	.0140	....	
13,750	55,000	.0150	.0039	
14,000	56,000	.018	....	
14,500	58,000	.026	....	
15,000	60,000	.041	....	
15,500	62,000	.078	....	
16,000	64,000	.148	....	
16,500	66,000	.253	....	
16,980	67,920	....	....	Tensile strength.
0.	0.	.48	....	= 8.0 per cent.

Elongation of inch sections, ″.22*, ″.06, ″.05, ″.05, ″.06, ″04.
Diameter at fracture, ″.45. Area, .159 square inch.
Contraction of area, 36.4 per cent.
Fractured ″.55 from neck. Appearance, fine fibrous.

COLD ROLLED IRON.

No. 4566.

Specimen from outer end of endurance shaft No. 123.
Same form as No. 4563.
Diameter, 1″.
Sectional area, .7854 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
785	1,000	0.	0.	Initial load.
3,927	5,000	.0015	0.	
7,854	10,000	.0032	.0002	
11,781	15,000	.0052	.0002	
15,708	20,000	.0070	.0001	
19,635	25,000	.0090	.0001	
23,562	30,000	.0108	.0001	
27,489	35,000	.0126	.0001	
31,416	40,000	.0143	.0001	Test discontinued.

COLD ROLLED IRON.

No. 4565.

Specimen from outer end of endurance shaft No. 124.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0009	0.	
2,500	10,000	.0019	....	
3,750	15,000	.0029	....	
5,000	20,000	.0040	0.	
6,250	25,000	.0051	....	
7,500	30,000	.0063	0.	
8,750	35,000	.0073	....	
10,000	40,000	.0084	0.	
11,250	45,000	.0098	0.	
12,500	50,000	.0112	.0008	
12,750	55,000	.0117	....	
13,000	56,000	.0122	....	
13,250	57,000	.0127	....	
13,500	54,000	.0137	....	
13,750	55,000	.0141	.0022	
14,000	56,000	.0158	....	
14,250	57,000	.0171	....	
14,500	58,000	.0203	....	
14,750	59,000	.0230	....	
15,000	60,000	.0321	.0187	
17,080	68,320	....	....	Tensile strength.
0	0	.57	....	=9.5 per cent.

Elongation of inch sections, ″.06, ″.08, ″.09, ″.07, ″.07, ″.20*.
Diameter at fracture, ″.47. Area, .174 square inch.
Contraction of area, 30.4 per cent.
Fractured 5″ from neck. Appearance, fibrous.

COLD ROLLED IRON.

No. 4567.

Specimen from outer end of endurance shaft No. 124.
Same form as No. 4563.
Diameter, 1″.
Sectional area, .7854 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
785	1,000	0.	0.	Initial load.
3,927	5,000	.0012	0.	
7,854	10,000	.0031	0.	
11,781	15,000	.0049	....	
15,708	20,000	.0066	0.	
19,635	25,000	.0082	....	
23,562	30,000	.0101	0.	
27,489	35,000	.0119	....	
31,416	40,000	.0138	0.	Test discontinued.

CAST IRON.

No. 4635.

Specimen from outer end of endurance shaft No. 30.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
500	2,000	.0003	....	
750	3,000	.0005	....	
1,000	4,000	.0008	....	
1,250	5,000	.0010	.0001	
1,500	6,000	.0011	....	
1,750	7,000	.0013	....	
2,000	8,000	.0015	....	
2,250	9,000	.0018	....	
2,500	10,000	.0020	.0002	
2,750	11,000	.0022	....	
3,000	12,000	.0025	....	
3,250	13,000	.0027	....	
3,500	14,000	.0029	....	
3,750	15,000	.0032	.0004	
4,000	16,000	.0035	....	
4,250	17,000	.0038	....	
4,500	18,000	.0042	....	
4,750	19,000	.0046	....	
5,000	20,000	.0051	.0011	
5,250	21,000	.0056	....	
5,500	22,000	.0062	....	
5,750	23,000	.0068	....	
6,000	24,000	.0077	....	
6,250	25,000	.0030	....	
7,990	31,960	....	....	Tensile strength.

Fractured ″.6 from neck. Appearance, fine granular.

CAST IRON.

No. 4636.

Specimen from outer end of endurance shaft No. 30.
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
500	2,000	.0002	....	
750	3,000	.0004	....	
1,000	4,000	.0006	....	
1,250	5,000	.0009	0.	
1,500	6,000	.0010	....	
1,750	7,000	.0013	....	
2,000	8,000	.0014	....	
2,250	9,000	.0015	....	
2,500	10,000	.0017	0.	
2,750	11,000	.0019	....	
3,000	12,000	.0021	....	
3,250	13,000	.0023	....	
3,500	14,000	.0026	....	
3,750	15,000	.0029	.0002	
4,000	16,000	.0032	....	
4,250	17,000	.0036	....	
4,500	18,000	.0040	....	
4,750	19,000	.0042	....	
5,000	20,000	.0048	.0010	
5,250	21,000	.0052	....	
5,500	22,000	.0059	....	
5,750	23,000	.0067	....	
6,000	24,000	.0075	....	
6,250	25,000	.0082	.0030	
7,830	31,320	....	....	Tensile strength.

Fractured ″.5 from neck. Appearance, fine granular.

CAST IRON.

No. 4637.

Specimen from outer end of endurance shaft No. 30.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
500	2,000	.0002	....	
750	3,000	.0004	....	
1,000	4,000	.0006	....	
1,250	5,000	.0008	0.	
1,500	6,000	.0009	....	
1,750	7,000	.0011	....	
2,000	8,000	.0012	....	
2,250	9,000	.0014	....	
2,500	10,000	.0016	0.	
2,750	11,000	.0018	....	
3,000	12,000	.0021	....	
3,250	13,000	.0023	....	
3,500	14,000	.0027	....	
3,750	15,000	.0029	.0002	
4,000	16,000	.0031	....	
4,250	17,000	.0034	....	
4,500	18,000	.0039	....	
4,750	19,000	.0042	....	
5,000	20,000	.0048	.0009	
5,250	21,000	.0052	....	
5,500	22,000	.0057	....	
5,750	23,000	.0064	....	
6,000	24,000	.0072	....	
6,250	25,000	.0081	.0029	
7,100	28,400	....	....	Tensile strength.

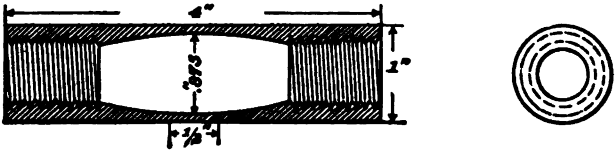
Fractured ″.25 from neck. Appearance, fine granular. Fractured surface contains a blowhole ″.08 diameter.

ANNULAR TENSION SPECIMENS

FROM

ENDURANCE SHAFTS NOT RUPTURED.

FORM OF SPECIMENS.



STEEL.

No. 5774.

Annular specimen from outer end of endurance shaft No. 131.

Diameters, { exterior, 1″.
interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0001	....	
1,840	10,000	.0005	....	
2,760	15,000	.0009	....	
3,680	20,000	.0012	0.	
4,600	25,000	.0017	....	
5,520	30,000	.0020	0.	
6,440	35,000	.0023	....	
7,360	40,000	.0026	0.	
8,096	44,000	.0029	....	Elastic limit.
8,280	45,000	.0200	....	
8,464	46,000	.0250	....	
8,648	47,000	.0270	....	
8,832	48,000	.0300	....	
9,016	49,000	.0330	....	
9,200	50,000	.0370	....	
9,384	51,000	.0409	....	
9,568	52,000	.0460	....	
9,752	53,000	.0482	....	
9,936	54,000	.0530	....	
10,120	55,000	.0569	....	
11,820	64,240	....	....	Tensile strength.

Elongation of the middle inch section, ″.31.

Exterior diameter drawn down to ″.82.

Appearance of fracture, silky.

STEEL.

No. 5775.

Annular specimen from middle of endurance shaft No. 131.

Diameters, { exterior, 1″.
interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1, 000	0.	0.	Initial load.
920	5, 000	.0002	....	
1, 840	10, 000	.0006	....	
2, 760	15, 000	.0009	....	
3, 680	20, 000	.0012	0.	
4, 600	25, 000	.0017	....	
5, 520	30, 000	.0020	0.	
6, 440	35, 000	.0023	....	
7, 360	40, 000	.0028	0.	
7, 544	41, 000	.0029	....	
7, 728	42, 000	.0030	....	
7, 912	43, 000	.0032	....	Elastic limit.
8, 096	44, 000	.0039	....	
8, 280	45, 000	.0048	....	
8, 464	46, 000	.0051	....	
8, 648	47, 000	.0065	....	
8, 832	48, 000	.0083	....	
9, 016	49, 000	.0102	....	
9, 200	50, 000	.0128	....	
9, 384	51, 000	.0149	....	
9, 568	52, 000	.0165	....	
9, 752	53, 000	.0180	....	
9, 936	54, 000	.0210	....	
10, 120	55, 000	.0260	.0219	
12, 340	67, 070	....	....	Tensile strength.

Elongation of middle inch section, ″.27.

Exterior diameter drawn down to ″.82.

Appearance of fracture, silky.

STEEL.

No. 4735.

Annular specimen from middle of endurance shaft No. 132.

Diameters, { exterior, 1″. / interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0001	....	
1,840	10,000	.0003	....	
3,680	20,000	.0010	0.	
4,600	25,000	.0012	....	
5,520	30,000	.0017	— .0001	
5,704	31,000	.0018	....	
5,888	32,000	.0019	....	
6,072	33,000	.0019	....	
6,256	34,000	.0020	....	
6,440	35,000	.0020	— .0001	
6,624	36,000	.0021	....	
6,808	37,000	.0021	....	
6,992	38,000	.0022	....	
7,176	39,000	.0022	....	
7,360	40,000	.0023	0.	
7,544	41,000	.0025	....	
7,728	42,000	.0028	....	
7,912	43,000	.0029	....	
8,096	44,000	.0031	....	
8,280	45,000	.0036	.0005	
8,464	46,000	.0041	....	
8,648	47,000	.0046	....	
8,832	48,000	.0060	....	
9,016	49,000	.0070	....	
9,200	50,000	.0091	.0056	
9,384	51,000	.0105	....	
9,568	52,000	.0117	....	
9,752	53,000	.0138	....	
9,936	54,000	.0165	....	
10,120	55,000	.0192	....	
10,304	56,000	.0230	....	
10,488	57,000	.0200	....	
10,672	58,000	.0300	....	
10,856	59,000	.0340	....	
11,040	60,000	.0421	....	
11,224	61,000	.0460	....	
11,408	62,000	.0530	....	
11,592	63,000	.0619	....	
11,776	64,000	.0771	....	
11,960	65,000	.1002	....	
12,340	67,070	....	....	Tensile strength.

Elongation of middle inch section, ″.25.

Appearance of fracture, silky.

STEEL.

No. 4736.

Annular specimen from outer end of endurance shaft No. 132.
Diameters, { exterior, 1″. / interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0007	....	
3,680	20,000	.0012	0.	
4,600	25,000	.0019	....	
5,520	30,000	.0022	0.	
6,440	35,000	.0024	....	
7,360	40,000	.0029	.0002	
7,544	41,000	.0153	....	
7,728	42,000	.0199	....	
7,912	43,000	.0220	....	
8,096	44,000	.0241	....	
8,280	45,000	.0282	.0250	
8,464	46,000	.0293	....	
8,648	47,000	.0345	....	
8,832	48,000	.0381	....	
9,016	49,000	.0432	....	
9,200	50,000	.0489	.0450	
9,384	51,000	.0523	....	
9,568	52,000	.0608	....	
9,752	53,000	.0660	....	
9,936	54,000	.0701	....	
10,120	55,000	.0787	....	
10,304	56,000	.0901	....	
10,488	57,000	.1031	....	
10,672	58,000	.1172	....	
10,856	59,000	.1253	....	
11,040	60,000	.1500	....	Tensile strength.
11,224	61,000	....	....	

Elongation of middle inch section, ″.29.
Appearance of fracture, silky.

STEEL.

No. 4745.

Annular specimen from outer end of endurance shaft No. 133.

Diameters, { exterior, 1″.
{ interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0001	0.	
1,840	10,000	.0008	....	
3,680	20,000	.0011	....	
5,520	30,000	.0019	0.	
5 704	31,000	.0020	....	
5,888	32,000	.0020	....	
6,072	33,000	.0021	....	
6,256	34,000	.0021	....	
6,440	35,000	.0022	....	
6,624	36,000	.0023	....	
6,808	37,000	.0023	....	
6,992	38,000	.0024	....	
7,176	39,000	.0024	....	
7,360	40,000	.0025	0.	
7,544	41,000	.0026	....	
7,728	42,000	.0027	....	
7,912	43,000	.0028	....	
8,096	44,000	.0029	....	Elastic limit; load fell.
7,360	40,000	.0070	....	
7,544	41,000	.0108	....	
7,728	42,000	.0167	....	
7,912	43,000	.0203	....	
8,096	44,000	.0240	....	
8,280	45,000	.0263	....	
8,464	46,000	.0283	....	
8,648	47,000	.0327	....	
8,832	48,000	.0365	....	
9,016	49,000	.0410	....	
9,200	50,000	.0460	....	
9,384	51,000	.0510	....	
9,568	52,000	.0560	....	
9,752	53,000	.0592	....	
9,936	54,000	.0673	....	
10,120	55,000	.0769	....	
10,304	56,000	.0850	....	
10,488	57,000	.0960	....	
10,672	58,000	.1098	....	
11,188	60,770	....	....	Tensile strength.

Elongation of middle inch section, .25 square inch.
Appearance of fracture, silky.

STEEL.

No. 4746.

Annular specimen from middle of length of endurance shaft No. 133.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	0.	
1,840	10,000	.0007	....	
3,680	20,000	.0011	0.	
5,520	30,000	.0020	0.	
5,704	31,000	.0021	....	
5,888	32,000	.0021	....	
6,072	33,000	.0022	....	
6,256	34,000	.0022	....	
6,440	35,000	.0023	....	
6,624	36,000	.0023	....	
6,808	37,000	.0026	....	
6,992	38,000	.0028	....	
7,176	39,000	.0029	....	
7,360	40,000	.0029	0.	
7,544	41,000	.0030	....	
7,728	42,000	.0031	....	Elastic limit.
7,912	43,000	.0034	....	
8,096	44,000	.0039	....	
8,280	45,000	.0042	.0011	
8,464	46,000	.0050	....	
8,648	47,000	.0060	....	
8,832	48,000	.0070	....	
9,016	49,000	.0090	....	
9,200	50,000	.0107	.0069	
9,384	51,000	.0121	....	
9,568	52,000	.0140	....	
9,752	53,000	.0161	....	
9,936	54,000	.0202	....	
10,120	55,000	.0240	....	
10,304	56,000	.0273	....	
10,488	57,000	.0325	....	
10,672	58,000	.0360	....	
10,856	59,000	.0420	....	
11,040	60,000	.0539	....	
11,224	61,000	.0600	....	
16,860	91,630	....	....	Tensile strength.

Elongation of middle inch section, ″.24.
Appearance of fracture, silky.

STEEL.

No. 4747.

Annular specimen from outer end endurance shaft No. 134.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0001	0.	
1,840	10,000	.0004	....	
3,680	20,000	.0010	0.	
5,520	30,000	.0019	....	
6,440	35,000	.0021	0.	
6,624	36,000	.0021	....	
6,808	37,000	.0022	....	
6,992	38,000	.0022	....	
7,176	39,000	.0023	....	
7,360	40,000	.0024	....	Elastic limit.
7,544	41,000	.0027	....	
7,728	42,000 {	.0031 .0053	....	
8,096	44,000	.0146	....	
8,280	45,000	.0198	.0163	
8,464	46,000	.0219	....	
8,648	47,000	.0241	....	
8,832	48,600	.0279	....	
9,016	49,000	.0318	....	
9,200	50,000	.0353	.0319	
9,384	51,000	.0389	....	
9,568	52,000	.0420	....	
9,752	53,000	.0461	....	
9,936	54,000	.0511	....	
10,120	55,000	.0600	....	
10,304	56,000	.0675	....	
10,488	57,000	.0735	....	
10,672	58,000	.0877	....	
10,856	59,000	.0962	....	
11,040	60,000	.1100	....	
11,224	61,000	.1420	....	
11,246	61,120	....	....	Tensile strength.

Elongation of middle inch section, ″.22.

Appearance of fracture, silky.

STEEL.

No. 4748.

Annular specimen from middle of length of endurance shaft No. 134.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	0.	
1,840	10,000	.0006	0.	
3,680	20,000	.0011	0.	
5,520	30,000	.0020	0.	
6,440	35,000	.0023	0.	
6,624	36,000	.0024	....	Elastic limit.
6,808	37,000	.0027	....	
6,992	38,000	.0029	....	
7,176	39,000	.0030	....	
7,360	40,000	.0032	.0008	
7,544	41,000	.0037	....	
7,728	42,000	.0040	....	
7,912	43,000	.0047	....	
8,096	44,000	.0052	....	
8,280	45,000	.0069	....	
8,464	46,000	.0075	.0037	
8,648	47,000	.0087	....	
8,832	48,000	.0101	....	
9,016	49,000	.0119	....	
9,200	50,000	.0141	.0104	
9,384	51,000	.0162	....	
9,568	52,000	.0193	....	
9,752	53,000	.0209	....	
9,936	54,000	.0238	....	
10,120	55,000	.0264	....	
10,304	56,000	.0301	....	
10,488	57,000	.0246	....	
10,672	58,000	.0392	....	
10,856	59,000	.0455	....	
11,040	60.000	.0524	....	
11,224	61,000	.0611	....	
11,408	62,000	.0750	....	
11,592	63,000	.0894	....	
11,776	64,000	.1110	....	
11,890	64,620	.1380	....	Tensile strength.

Elongation of middle inch section ″.22.

Appearance of fracture, silky.

COLD ROLLED IRON.

No. 4765.

Annular specimen from middle of length of endurance shaft No. 138.

Diameters, { exterior, 1″.
interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1.840	10,000	.0007	....	
3,680	20,000	.0012	0.	
4,600	25,000	.0018	....	
5,520	30,000	.0020	0.	
6.440	35,000	.0022	....	
7,360	40,000	.0030	.0001	
7,544	41,000	.0030	....	
7,728	42,000	.0031	....	
7,912	43,000	.0031	....	
8,096	44,000	.0033	....	
8,280	45,000	.0036	.0005	
8,464	46,000	.0038	....	
8,648	47,000	.0040	....	
8,832	48,000	.0041	....	
9,016	49,000	.0046	....	
9,200	50,000	.0050	.0017	
9,384	51,000	.0056	....	
9,568	52,000	.0060	....	
9,752	53,000	.0070	....	
9,890	53,750	....	....	Tensile strength.

Elongation of middle inch section, ″.05.

Appearance of fracture, fibrous, 90 per cent, fine granular, 10 per cent.

The granular metal fractured first.

COLD ROLLED IRON.

No. 4766.

Annular specimen from outer end of endurance shaft No. 138.
Diameters, { exterior, 1″. interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0006	....	
3,680	20,000	.0011	....	
5,520	30,000	.0017	0.	
6,440	35,000	.0020	....	
7,360	40,000	.0023	0.	
8,280	45,000	.0028	0.	
8,464	46,000	.0029	....	
8,648	47,000	.0029	....	
8,832	48,000	.0030	....	
9,016	49,000	.0030	....	
9,200	50,000	.0031	0.	
9,384	51,000	.0031	....	
9,568	52,000	.0032	....	
9,752	53,000	.0032	....	
9,936	54,000	.0033	....	
10,120	55,000	.0035	.0001	
10,304	56,000	.0037	....	
10,488	57,000	.0039	....	
10.672	58,000	.0040	....	
10,856	59.000	.0041	....	
11,040	60,000	.0045	.0009	
11,224	61,000	.0050	....	
11,408	62,000	,0052	....	
11,592	63,000	,0060	....	
11,776	64,000	,0067	....	
11,960	65,000	,0070	.0030	
12,144	66,000	,0080	....	
12,328	67,000	,0097	....	
12.512	68,000	,0119	....	
12,696	69,000	,0141	....	
12,880	70,000	,0175	.0130	
13,064	71,000	,0189	....	
13,248	72,000	,0249	....	
13,432	73,000	,0330	....	
13.510	73,420	....	....	Tensile strength.

Elongation of middle inch section, ″.08.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4767.

Annular specimen from middle of length of endurance shaft No. 139.

Diameters, { exterior, 1″.
interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0006	....	
3,680	20.000	.0012	0.	
4,600	25,000	.0018	....	
5,520	30,000	.0020	0.	
6,440	35,000	.0023	....	
7,360	40,000	.0028	0.	
8,280	45,000	.0031	.0001	
9,200	50,000	.0036	.0002	
9,384	51,000	.0037	....	
9,568	52,000	.0039	....	
9,752	53,000	.0040	....	
9,936	54,000	.0041	....	
10,120	55,000	.0046	.0010	
10,304	56,000	.0050	....	
10,488	57,000	.0052	....	
10,672	58,000	.0057	....	
10,856	59,000	.0062	....	
11,040	60.000	.0070	.0030	
11,224	61,000	.0084	....	
11,520	62,610	....	....	Tensile strength.

Elongation of middle inch section, ″.07.

Appearance of fracture, fibrous; trace of granulation.

COLD ROLLED IRON.

No. 4768.

Annular specimen from outer end of endurance shaft No. 139.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1, 000	0.	0.	Initial load.
920	5, 000	.0001	....	
1, 840	10, 000	.0006	....	
3, 680	20, 000	.0012	....	
4, 600	25, 000	.0018	....	
5, 520	30, 000	.0020	0.	
6, 440	35, 000	.0023	....	
7, 360	40, 000	.0028	0.	
8, 280	45, 000	.0031	....	
9, 200	50, 000	.0036	.0001	
9, 384	51, 000	.0038	....	
9, 568	52, 000	.0039	....	
9, 752	53, 000	.0040	....	
9, 936	54, 000	.0041	....	
10, 120	55, 000	.0044	.0008	
10, 304	56, 000	.0049	....	
10, 488	57, 000	.0051	....	
10, 672	58, 000	.0053	....	
10, 856	59, 000	.0056	....	
11, 040	60, 000	.0060	.0020	
11, 224	61, 000	.0069	....	
11, 408	62, 000	.0072	....	
11, 592	63, 000	.0085	....	
11, 776	64, 000	.0095	....	
11, 960	65, 000	.0104	.0060	
12. 144	66, 000	.0121	....	
12, 328	67, 000	.0149	....	
12, 512	68, 000	.0175	....	
12, 696	69, 000	.0210	....	
12, 880	70, 000	.0262	.0212	
13, 320	72, 390	....	....	Tensile strength.

Elongation of middle inch section, ″.09.

Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4769.

Annular specimen from middle of length of endurance shaft No. 142.
Diameters, { exterior, 1″.
{ interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0009	0.	
2,760	15,000	.0014	....	
3,680	20,000	.0021	0.	
4,600	25,000	.0030	....	
5,520	30,000	.0045	.0011	
5,704	31,000	.0050	....	
5,888	32,000	.0056	....	
6,072	33,000	.0064	....	
6,256	34,000	.0074	....	
6,370	34,620	....	....	Tensile strength.

Elongation of middle inch section, ″.03.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4770.

Annular specimen from outer end of endurance shaft No. 142
Diameters, { exterior, 1″.
{ interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0007	....	
3,680	20,000	.0011	....	
5,520	30,000	.0018	—.0001	
6,440	35,000	.0020	....	
7,360	40,000	.0031	....	
12,810	69,620	....	....	Tensile strength.

Elongation of middle inch section, ″.10.
Appearance of fracture, fibrous.
Under 43,000 pounds per square inch one end of specimen opened along a longitudinal seam in the metal.
Ring driven over specimen closing longitudinal seam and test resumed.

COLD ROLLED IRON.

No. 4771.

Annular specimen from middle of length of endurance shaft No. 143.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0004	....	
1,840	10,000	.0008	....	
2,760	15,000	.0010	....	
3,680	20,000	.0013	0.	
4,600	25,000	.0018	....	
5,520	30,000	.0020	.0001	
6,440	35,000	.0022	....	
6,624	36,000	.0023	....	
6,808	37,000	.0025	....	
6,992	38,000	.0026	....	
7,176	39,000	.0026	....	
10,620	57,720	....	....	Tensile strength.

Elongation of middle inch section, ″.06.

Appearance of fracture, fibrous.

Opened a longitudinal seam under 40,000 pounds per square inch.

Ring driven on specimen over threaded end closing up seam, and test resumed.

COLD ROLLED IRON.

No. 4772.

Annular specimen from outer end of endurance shaft No. 143.
Diameters, { exterior, 1″.
interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0008	....	
2,760	15,000	.0010	....	
3,680	20,000	.0012	....	
4,600	25,000	.0018	....	
5,520	30,000	.0020	0.	
6,440	35,000	.0023	....	
7,360	40,000	.0029	.0001	
8,280	45,000	.0031	....	
8,464	46,000	.0032	....	
8,648	47,000	.0032	....	
8,832	48,000	.0034	....	
9,016	49,000	.0036	....	
9,200	50,000	.0039	.0004	
9,384	51,000	.0041	....	
9,568	52,000	.0043	....	
9,752	53,000	.0045	....	
9,936	54,000	.0050	....	
10,120	55,000	.0053	.0019	
10,304	56,000	.0060	....	
10,488	57,000	.0063	....	
10,672	58,000	0070	....	
10,856	59,000	.0075	....	
11,040	60,000	.0084	.0044	
11,224	61,000	.0099	....	
11,408	62,000	.0110	....	
11,592	63,000	.0132	....	
11,776	64,000	.0148	....	
11,960	65,000	.0163	.0119	
13,240	71,960	....	....	Tensile strength.

Elongation of middle inch sections, ″.10.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4773.

Annular specimen from middle of length of endurance shaft No. 144.
Diameters, { exterior, 4″. / interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0003	....	
1,840	10,000	.0007	0.	
2,760	15,000	.0011	....	
3,680	20,000	.0013	0.	
4,600	25,000	.0018	....	
5,520	30,000	.0020	0.	
6,440	35,000	.0023	....	
7,360	40,000	.0028	0.	
8,280	45,000	.0031	....	
8,464	46,000	.0032	....	
8,648	47,000	.0033	....	
8,832	48,000	.0036	....	
9,016	49,000	.0038	....	
9,200	50,000	.0040	.0009	
9,384	51,000	.0042	....	
9,568	52,000	.0045	....	
9,752	53,000	.0049	....	
9,936	54,000	.0052	....	
10,120	55,000	.0060	.0023	
10,304	56,000	.0064	....	
10,488	57,000	.0069	....	
10,672	58,000	.0078	....	
10,856	59,000	.0084	....	
11,040	60,000	.0100	.0059	
11,224	61,000	.0109	....	
11,408	62,000	.0125	....	
11,592	63,000	.0140	....	
11,776	64,000	.0180	....	
11,960	65,000	.0213	.0170	
12,144	66,000	.0219	....	
12,328	67,000	.0251	....	
12,512	68,000	.0359	....	
12,696	69,000	.0400	....	
12,880	70,000	.0620	....	
12,980	70,540	....	....	Tensile strength.

Elongation of middle inch section, ″.09.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4774.

Annular specimen from outer end of endurance shaft No. 144.
Diameters, { exterior, 1″. interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0003	....	
1,840	10,000	.0008	....	
2,760	15,000	.0011	....	
3,680	20,000	.0014	....	
4,600	25,000	.0018	....	
5,520	30,000	.0021	0.	
6,440	35,000	.0025	....	
7,360	40,000	.0030	.0001	
8,280	45,000	.0034	....	
8,464	46,000	.0036	....	
8,648	47,000	.0038	....	
8,832	48,000	.0040	....	
9,016	49,000	.0042	....	
9,200	50,000	.0047	.0012	
9,384	51,000	.0050	....	
9,568	52,000	.0052	....	
9,752	53,000	.0060	....	
9,936	54,000	.0066	....	
10,120	55,000	.0072	.0036	
10,304	56,000	.0080	....	
10,488	57,000	.0092	....	
10,672	58,000	.0101	....	
10,856	59,000	.0110	....	
11,040	60,000	.0128	.0068	
11,224	61,000	.0150	....	
11,408	62,000	.0185	....	
11,592	63,000	.0202	....	
11,776	64,000	.0245	....	
11,960	65,000	.0287	.0240	
12,144	66,000	.0335	....	
12,328	67,000	.0450	....	
12,512	68,000	.0590	....	
12,630	68,640	....	....	Tensile strength.

Elongation of middle inch section, ″.10.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4775.

Annular specimen from middle of length of endurance shaft No. 146.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0007	....	
2,760	15,000	.0010	....	
3,680	20,000	.0012	0.	
4,600	25,000	.0017	....	
5,520	30,000	.0020	0.	
6,440	35,000	.0023	....	
7,360	40,000	.0029	.0002	
7,544	41,000	.0030	....	
7,728	42,000	.0031	....	
7,912	43,000	.0032	....	
8,096	44,000	.0034	....	
8,280	45,000	.0038	.0009	
8,464	46,000	.0040	....	
8,648	47,000	.0042	....	
8,832	48,000	.0044	....	
9,016	49,000	.0048	.0019	
9,200	50,000	.0051	....	
9,384	51,000	.0057	....	
9,568	52,000	.0062	....	
9,752	53,000	.0069	....	
9,936	54,000	.0080	....	
10,120	55,000	.0099	.0059	
10,304	56,000	....	....	Tensile strength.

Elongation of middle inch section, ″.05.

Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4776.

Annular specimen from outer end of endurance shaft No. 146.
Diameters, { exterior, 1″.
interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0006	....	
2,760	15,000	.0009	....	
3,680	20,000	.0011	....	
4,600	25,000	.0014	....	
5,520	30,000	.0019	0.	
6,440	35,000	.0022	....	
7,360	40,000	.0025	0.	
8,280	45,000	.0030	....	
9,200	50,000	.0034	....	
9,384	51,000	.0036	....	
9,568	52,000	.0038	....	
9,752	53,000	.0040	....	
9,936	54,000	.0042	....	
10,120	55,000	.0045	.0010	
10,304	56,000	.0050	....	
10,488	57,000	.0054	....	
10,672	58,000	.0060	....	
10,856	59,000	.0065	....	
11,040	60,000	.0080	.0040	
11,224	61,000	.0090	....	
11,408	62,000	.0115	....	
11,592	63,000	.0140	....	
11,776	64,000	.0180	....	
11,960	65,000	.0209	.0104	
12,144	66,000	.0290	....	
12,300	66,850	....	....	Tensile strength.

Elongation of middle inch section, ″.07.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4777.

Annular specimen from middle of length of endurance shaft No. 147.
Diameters, { exterior, 1″. interior, ″.875.
Sectional area, .184 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1, 000	0.	0.	Initial load.
920	5, 000	.0001	....	
1, 840	10, 000	.0003	....	
2, 760	15, 000	.0006	....	
3, 680	20, 000	.0009	0.	
4, 600	25, 000	.0013	....	
5, 520	30, 000	.0018	0.	
6, 440	35, 000	.0022	....	
7, 360	40, 000	.0027	0.	
8, 280	45, 000	.0031	....	
8, 464	46, 000	.0033	....	
8, 648	47, 000	.0036	....	
8, 832	48, 000	.0038	....	
9, 016	49, 000	.0040	....	
9, 200	50, 000	.0043	.0010	
9, 384	51, 000	.0048	....	
9, 568	52, 000	.0051	....	
9, 752	53, 000	.0053	....	
9, 936	54, 000	.0060	....	
10, 120	55, 000	.0066	.0029	
10, 304	56, 000	.0072	....	
10, 488	57, 000	.0082	....	
10, 672	58, 000	.0099	....	
10, 856	59, 000	.0109	....	
11, 040	60, 000	.0130	.0088	
11, 224	61, 000	.0151	....	
11, 408	62, 000	.0206	....	
11, 592	63, 000	.0246	....	
11, 776	64, 000	.0325	....	
11, 960	65, 000	.0362	.0339	
12, 040	65, 430	....	....	Tensile strength.

Elongation of middle inch section, ″.10.
Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4778.

Annular specimen from outer end of endurance shaft No. 147.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0005	....	
2,760	15,000	.0008	....	
3,680	20,000	.0010	....	
4,600	25,000	.0013		
5,520	30,000	.0017	0.	
6,440	35,000	.0020	....	
7,360	40,000	.0023	0.	
8,280	45,000	.0027	....	
9,200	50,000	.0031	.0001	
9,384	51,000	.0032	....	
9,568	52,000	.0033	....	
9,752	53,000	.0033	....	
9,936	54,000	.0034	....	
10,120	55,000	.0036	.0003	
10,304	56,000	.0038	....	
10,488	57,000	.0040	....	
10,672	58,000	.0043	....	
10,856	59,000	.0049	....	
11,040	60,000	.0052	.0017	
11,224	61,000	.0058	....	
11,408	62,000	.0072	....	
11,592	63,000	.0092	....	
11,776	64,000	.0120	....	
11,960	65,000	.0150	.0107	
12,144	66,000	.0183	....	
12,328	67,000	.0250	....	
12,512	68,000	.0410	....	Tensile strength.

Elongation of middle inch section, ″.08.

Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4779.

Annular specimen from middle of length of endurance shaft No. 148.

Diameters, { exterior, 1″.
interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10.000	.0005	....	
2,760	15,000	.0008	....	
3,680	20,000	.0010	0.	
4,600	25,000	.0015	....	
5,520	30,000	.0019	0.	
6,440	35,000	.0023	....	
7.360	40,000	.0029	.0001	
8,280	45,000	.0034	.0003	
8,464	46,000	.0036	....	
8.648	47,000	.0038	....	
8,832	48,000	.0040	....	
9,016	49,000	.0044	....	
9,200	50,000	.0051	.0017	
9,384	51,000	.0058	....	
9,568	52,000	.0063	....	
9,752	53,000	.0074	....	
9,936	54,000	.0089	....	
10,120	55,000	.0108	.0068	
10,304	56,000	.0126	....	
10,488	57,000	.0152	....	
10,672	58,000	.0189	....	
10,856	59,000	.0260	....	
11,040	60,000	.0274	.0231	
11,224	61,000	.0440	....	Tensile strength.

Elongation of middle inch section, ″.06.

Appearance of fracture, fibrous.

COLD ROLLED IRON.

No. 4780.

Annular specimen from outer end of endurance shaft No. 148.

Diameters, { exterior, 1″.
{ interior, ″.875.

Sectional area, .184 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0002	....	
1,840	10,000	.0005	....	
2,760	15,000	.0008	....	
3,680	20,000	.0010	....	
4,600	25,000	.0013	....	
5,520	30,000	.0017	0.	
6,440	85,000	.0020	....	
7,360	40,000	.0023	0.	
8,280	45,000	.0030	....	
9,200	50,000	.0037	.0004	
9,384	51,000	.0039	....	
9,568	52,000	.0041	....	
9,752	53,000	.0043	....	
9,936	54,000	.0049	....	
10,120	55,000	.0057	.0020	
10,304	56,000	.0066	....	
10,488	57,000	.0075	....	
10,672	58,000	.0089	....	
10,856	59,000	.0101	....	
11,040	60,000	.0123	.0081	
11,224	61,000	.0166	....	
11,408	62,000	.0226	....	
11,592	63,000	.0280	....	
11,776	64,000	{ .0390 .0510	....	} Tensile strength.

Elongation of middle inch section, ″.10.

Appearance of fracture, fibrous.

TABULATION OF TENSION SPECIMENS FROM BARS RUPTURED BY ENDURANCE TESTS OF ROTATING SHAFTS.

SOLID SPECIMENS.

Tension test number.	Endurance test number.	Material.	Location in shaft.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Gauged length.	Elongation in gauged length.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
				Sq. in.	*Pounds.*	*Pounds.*	*Inches.*	*Per cent.*	*Per cent.*		
4561	120	Steel	Outer end	.25	69,000	125,240	6	9.0	11.6	Fine granular	".07,".07,".08,".09,".12,".11*
4563	120	do	do	.7854		59,870	Fractured at root of thread.			do	
4562	121	do	do	.25	71,000	128,840	6	7.3	8.4	do	".07,".08,".08,".07,".07*,".07*
4568	121	do	do	.7854		†50,000					
4564	123	Cold rolled iron	Outer end	.25		67,920	6	8.0	36.4	Fine fibrous	".22*,".06,".05,".05,".06,".04
4566	123	do	do	.7854		†40,000					
4565	124	do	do	.25		68,320	6	9.5	30.4	Fibrous	".06,".08,".09,".07,".07,".20*
4567	124	do	do	.7854		†40,000					
4635	80	Cast iron	Outer end	.25		31,960	3			Fine granular	
4636	80	do	do	.25		31,320	3			do	
4637	80	do	do	.25		28,400	3			Fine granular surface contains a blow hole ".08 diameter.	

† Tensile strength not reached.

SPECIMENS FROM SHAFTS NOT RUPTURED. ANNULAR SPECIMENS.

Tension test number.	Endurance test number.	Material.	Location in shaft.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation of middle inch section.	Appearance of fracture.
				Sq. inch.	*Pounds.*	*Pounds.*	*Inch.*	
5774	131	Steel	Outer end	.184	44,000	64,240	.31	Silky.
5775	131	...do	Middle	.184	43,000	67,070	.27	Do.
4735	132	...do	Middle	.184	....	67,070	.25	Do.
4736	132	...do	Outer end	.184	....	61,000	.29	Do.
4745	133	...do	Outer end	.184	44,000	60,770	.25	Do.
4746	133	...do	Middle	.184	42,000	91,630	.24	Do.
4747	134	...do	Outer end	.184	40,000	61,120	.22	Do.
4748	184	...do	Middle	.184	36,000	64,620	.22	Do.
4765	138	Cold rolled iron	Middle	.184	....	53,750	.05	Fibrous 90 per cent, fine granular 10 per cent.
4766	138	...do	Outer end	.184	....	73,420	.08	Fibrous.
4767	139	...do	Middle	.184	....	62,610	.07	Fibrous, trace of granulation.
4768	139	...do	Outer end	.184	....	72,390	.09	Fibrous.
4769	142	...do	Middle	.184	....	34,620	.08	Do.
4770	142	...do	Outer end	.184	....	69,620	.10	Do.
4771	143	...do	Middle	.184	....	57,720	.06	Do.
4772	143	...do	Outer end	.184	....	71,960	.10	Do.
4773	144	...do	Middle	.184	....	70,540	.09	Do.
4774	144	...do	Outer end	.184	....	68,640	.10	Do.
4775	146	...do	Middle	.184	....	56,000	.05	Do.
4776	146	...do	Outer end	.184	....	66,850	.07	Do.
4777	147	...do	Middle	.184	....	65,430	.10	Do.
4778	147	...do	Outer end	.184	....	68,000	.08	Do.
4779	148	...do	Middle	.184	....	61,000	.06	Do.
4780	148	...do	Outer end	.184	....	64,000	.10	Do.

CHAIN CABLE.

SHACKLES AND SWIVELS.

TENSILE TESTS OF CHAIN CABLE, SHACKLES, AND SWIVELS, FOR U. S. LIGHT-HOUSE INSPECTOR, THIRD DISTRICT.

TESTS OF CHAIN CABLE.

No. of test.	Marks.	Diameters.			Sectional area of chain.	Tensile strength.		Fracture.
		End links.	Outside studded links.	Studded links of chain.		Total.	Per square inch.	
		Inches.	*Inches.*	*Inches.*	*Sq. inches.*	*Pounds.*	*Pounds.*	
5517	"Bradlee & Co., Philadelphia."	1.85		1.50	3.53	146,500	41,500	Second link of chain at the side. Fibrous.
5518	do	1.88		1.50	3.53	149,700	42,410	Second link of chain at the quarter. Fibrous.
5519	do	1.88		1.50	3.53	143,900	40,760	Do.
5532	do	1.87	1.62	1.50	3.53	148,690	42,120	Middle link at the end. Fibrous.
5551	do	2.18	1.83	1.75	4.81	196,500	40,850	Middle link at side weld. Followed the scarf.
5537	"W. E. R. M. Co., Lebanon, Pa."	1.98		1.75	4.81	185,040	38,470	Middle link at the weld. In part fibrous and in part following scarf of weld.
5538	do	2.00		1.77	4.92	196,800	40,000	Middle link in vicinity of the weld; 40 per cent granular; 60 per cent fibrous oblique.
5539	do	2.00		1.76	4.86	181,950	37,440	End link at the weld.
5571	"U. S. W. N. Y."			1.74	4.75	187,700	39,520	First link at the weld. Followed the scarf.
5531	"Bradlee & Co. Philadelphia."	2.22	1.93	1.83	5.26	215,680	41,000	Next to the middle link in the quarter. Fibrous except a small granular spot at the outside of the link.
5549	do	2.22	1.93	1.85	5.38	220,050	40,900	Middle link at weld. Fibrous, slightly granular.
5550	do	2.27	1.98	1.87	5.49	219,900	40,050	First link at weld. Fibrous.
5552	do	2.22	1.95	1.90	5.67	217,250	38,320	First link at weld. Followed the scarf.
5578	do	2.26	2.01	1.85	5.38	217,300	40,390	First link in the quarter. Fibrous.
5577	do	2.23	2.00	1.90	5.67	209,700	36,980	First link in the quarter. Fibrous, 85 per cent; granular, 15 per cent.
5576	do	2.23	1.96	1.91	5.73	205,100	35,790	First link in the quarter. Fibrous.
5677	do	2.10	1.93	1.87	5.49	200,100	36,450	Middle link in the quarter. Fibrous.
5678	do	2.20	1.98	1.90	5.67	218,500	38,550	Do.
5679	do	2.20	1.98	1.93	5.85	214,900	36,730	First link at the side, following scarf, 60 per cent; fibrous, 20 per cent; granular, 20 per cent.
5680	do	2.22	1.93	1.90	5.67	227,200	40,070	Middle link in the quarter. Fibrous.
5715	do	2.20	1.95	1.90	5.67	224,850	39,660	First link in the quarter. Fibrous, 80 per cent; granular, 20 per cent.
5716	do	2.20	1.97	1.90	5.67	219,900	38,780	First link in the quarter. Fibrous.
5717	do	2.20	1.98	1.90	5.67	228,400	40,280	Do.
5718	do	2.22	1.96	1.89	5.61	213,800	38,110	Middle link at the side. Followed the scarf of weld.
5463	"J. B. C. & Co. Proved"	2.00		1.87	5.49	172,750	31,470	First studded link at the weld. Fibrous, trace of granulation.
5464	do	2.02		1.88	5.55	210,900	38,000	End link at the weld. Fibrous.
5465	do	2.00		1.88	5.55	196,850	35,470	Middle link at the weld. Followed the scarf.
5466	do	2.00		1.88	5.56	193,400	34,850	End link at the weld. Followed the scarf.
5467	do	2.00		1.88	5.55	192,700	34,720	Do.
5468	do	2.00		1.88	5.55	221,100	39,840	End link at the weld. Fibrous.
5477	do	2.15		1.88	5.55	199,200	35,890	First studded link at the weld. Fibrous.
5481	do	2.12		1.88	5.55	167,900	30,250	First studded link at the weld. Fibrous, slightly granular.

TENSILE TESTS OF CHAIN CABLE, SHACKLES, AND SWIVELS, FOR U. S. LIGHT-HOUSE INSPECTOR, THIRD DISTRICT—Cont'd.

TESTS OF CHAIN CABLE—Continued.

No. of test.	Marks.	Diameters.			Sectional area of chain.	Tensile strength.		Fracture.
		End links.	Outside studded links.	Studded links of chain.		Total.	Per square inch.	
		Inches.	*Inches.*	*Inches.*	*Sq. inches.*	*Pounds.*	*Pounds.*	
5483	"J. B. C. & Co. Proved."	2.12	....	1.87	5.49	193,850	35,310	First studded link at the weld. Fibrous.
5484	......do	2.12	....	1.87	5.49	197,100	35,900	Do.
5485	......do	2.12	....	1.87	5.49	200,600	36,540	First studded link at the weld. Followed the scarf. Fibrous.
5486	......do	2.12	....	1.87	5.49	200,980	36,610	Do.
5469	......do	2.12	....	2.00	6.28	221,900	35,330	Middle link at the weld. Followed the scarf.
5470	......do	2.13	....	2.02	6.41	204,100	31,840	First studded link at the weld. Followed the scarf.
5480	......do	2.28	....	2.00	6.28	214,900	34,220	Middle studded link at weld. Fibrous, following scarf.
5482	......do	2.25	....	2.00	6.28	206,400	32,870	First studded link at the weld. In part fibrous, in part following the scarf.
5570	U. S. W. N. Y.	....	....	1.96	6.03	229,800	38,110	Middle link at weld. Followed the scarf, 50 per cent of which was dark colored. The opposite end of the link fractured, with a granular appearance.
5703	"Baker Proved"	2.12	....	2.06	6.66	212,100	31,850	Middle link in the side and the quarter. Granular.
5704	......do	2.11	....	2.00	6.28	246,200	39,200	First studded link at the weld. Followed the scarf, 40 per cent; granular, 60 per cent.
5705	......do	2.12	....	2.00	6.28	176,800	28,150	First studded link at the weld and side. Granular.
5719	....	2.25	....	1.98	6.16	219,500	35,630	First studded link at weld in end. Followed the scarf.
5740	"Bradlee & Co., Philadelphia"	2.18	1.97	1.95	5.97	228,100	38,210	Middle link of chain in the side near the stud. Fibrous, 80 per cent; granular, 20 per cent.
5516	......do	2.45	....	2.23	7.81	271,600	34,780	First studded link in the quarter. Granular, 60 per cent; fibrous, 40 per cent.

Two studded links and one end link from both samples of chain, tests Nos. 5704 and 5705, were annealed and then tested. No. 5704 was heated bright red and No. 5705 cherry red, and both cooled in the open air.

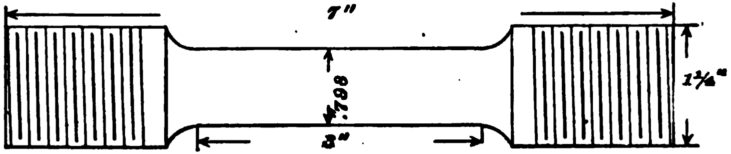
No. of test.	Marks.	End links.	Outside studded links.	Studded links of chain.	Sectional area of chain.	Total.	Per square inch.	Fracture.
5704*a*	"Baker. Proved"	2.11	....	2.00	6.28	219,100	34,890	Studded link next end link at the quarter. Fibrous, with trace of granulation. After the link had parted it sustained 88,200 pounds tension as an open link.
5705*a*	......do	2.12	....	2.00	6.28	190,100	30,270	Studded link in the quarter. Granular, 50 per cent; fibrous, 50 per cent.

DETAILS OF STRETCH UNDER STRESS OF CHAIN TEST NO. 5551.

Applied loads.	Elongation.		Remarks.
	Total.	Successive.	
Pounds.	*Inches.*	*Inches.*	
10,000	0.	0.	Initial load.
20,000	.10	.10	
30,000	.18	.08	
40,000	.26	.08	
50,000	.33	.07	
60,000	.39	.06	
70,000	.48	.09	
80,000	.63	.15	
90,000	.83	.20	
100,000	1.16	.33	
110,000	1.54	.38	
120,000	2.00	.46	Snapping sounds.
130,000	2.52	.52	
140,000	3.14	.62	
150,000	3.80	.66	
160,000	4.60	.80	
170,000	5.50	.90	
180,000	6.60	1.10	
190,000	7.96	1.36	
196,500	9.15	1.19	Tensile strength.

TENSION TESTS OF TWO SPECIMENS TAKEN FROM FRACTURED END LINK OF CHAIN TEST NO. 5719, WHICH FRACTURED BEFORE THE STUDDED LINKS OF THE CHAIN.

One specimen taken from each side of the link. One of them tested in the condition the metal was in while in the link; the other specimen was annealed by heating cherry red and cooling in the open air.



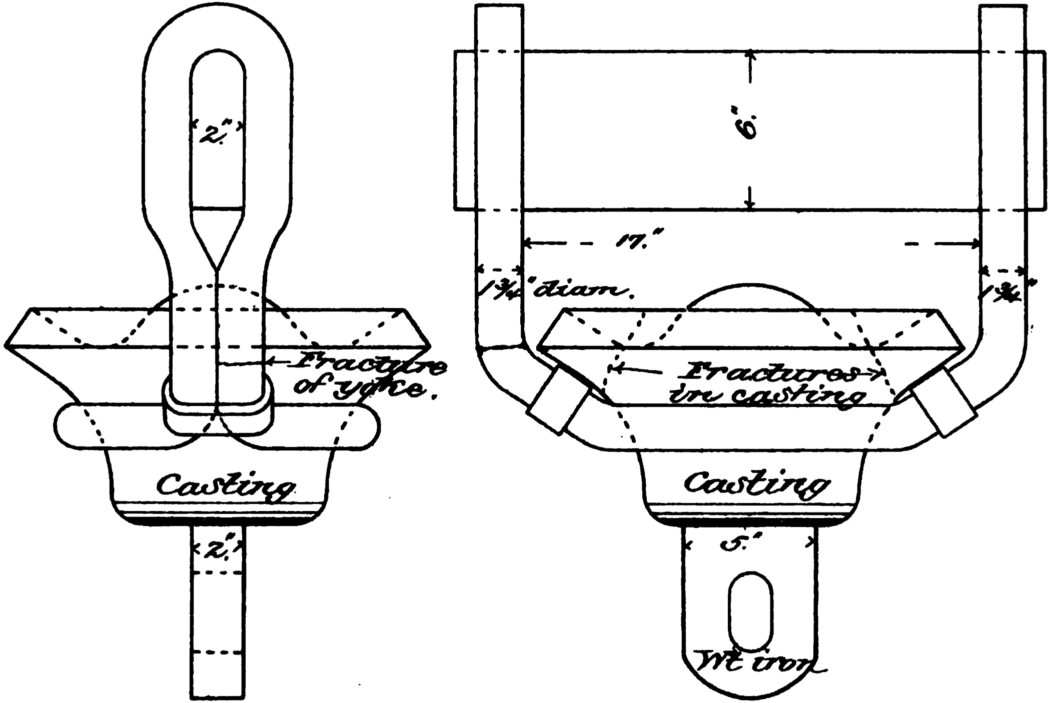
No. of test.	Condition.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 3 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
				Total.	Per square inch.	Total.	Per square inch.						
		Inch.	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inch.*	*Per ct.*	" *Sq. in.*	*Per ct.*		" " "
5733	Not annealed............	.798	.50	17,240	34,480	26,820	53,640	.58	19.3	Diam. .65=.332 ...	33.6	Fibrous............	.12, .35*, .11
5734	Annealed	.798	.50	13,250	26,500	24,210	48,420	.92	30.6	Diam. .59=.273 ...	45.4	....do	.49*, .26, .17

TESTS OF SHACKLES AND SWIVELS.

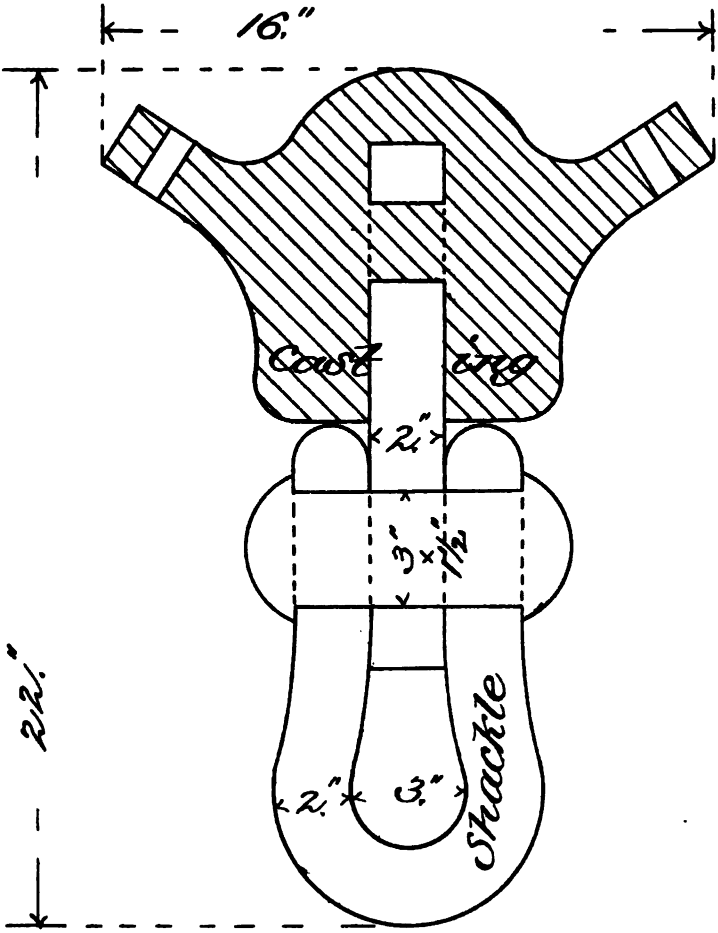
No. of test.	Description.	Tensile strength	Fractured.
		Pounds.	
5700	1⅛" light ship shackle...	81, 300	Across eye. Fibrous.
5701	......do	90, 380	Across eye, with fibrous appearance. Opposite side fractured back of eye. Granular.
5699	1¼" light ship shackle...	82, 100	Both parts back of the eyes. Fibrous, in part granular.
5755	......do	85, 800	Pulled tongue out of eye.
5756	......do	97, 600	Do.
5757	......do	95, 800	Do.
5752	1 5/16" light ship shackle..	125, 480	Bale of shackle.
5753	......do	116, 980	Do.
5754	......do	115, 740	Do.
5698	......do	100, 950	Both parts back of the eyes. Fibrous, in part granular.
5697	1⅜" light ship shackle...	122, 800	One part back of eye. Fibrous, slightly granular.
5750	......do	154, 620	Tongue,
5751	......do	149, 900	Bale of shackle.
5521	1⅜" shackle	152, 100	1⅜" studded link next shackle. Shackle not fractured.
5542	Shackle..................	171, 550	Eye across pin hole for securing tongue in position.
5543	......do	156, 200	Do.
5554	1¾" shackle	246, 200	2" studded link next shackle. Shackle not fractured.
5575	......do	167, 100	End across ⅝" pin hole. Fibrous, in part granular.
5534	1⅞" shackle	237, 960	Studded link next the shackle. Shackle not fractured.
5573	2" shackle	191, 200	End across ⅝" pin hole. Granular, in part fibrous.
5696	2" light ship shackle ...	212, 100	Across eye, which had 7/16 round key. Fibrous.
5702	......do	192, 900	Both parts back of eyes. Fibrous, in part granular.
5747	......do	180, 200	Tongue. Granular.
5748	......do	254, 600	Bale of shackle.
5749	......do	257, 580	Do.
5693	2⅛" buoy shackle	165, 900	Across both eyes. Fibsous, with granular streaks.
5694	......do	173, 100	Across one eye. Fibrous, with granular streaks.
5741	......do	273, 700	Bale of shackle.
5742	......do	277, 100	Key fractured, after which tongue drew out of eyes of shackle.
5743	......do	272, 300	Sheared tongue.
5744	2¼" light ship shackle ..	277, 150	Bale of shackle.
5745	......do	298, 600	Do.
5746	......do	290, 300	Do.
5695	......do	224, 000	Across both eyes. Fibrous, with granular streaks.
5520	1⅜" swivel	131, 100	Pulled head off stem of swivel.
5535	......do	181, 400	Eye of the stem at the side. Fibrous.
5536	......do	184, 080	Do.
5540	Swivel....................	149, 100	Pulled head off stem of swivel.
5541	......do	161, 060	Stem at inner end of eye at shoulder. Fibrous, with granular streak.
5553	1¾" swivel	250, 600	2" studded link next swivel. Swivel not fractured.
5574	......do	196, 300	Pulled head off stem of swivel.
5471	1⅞" swivel	193, 400	Neck of the stem of swivel. Fibrous.
5533	......do	283, 100	Studded link 2".2 diameter next the swivel. Swivel not fractured.
5572	2" swivel	274, 200	Male part across the eye. Fibrous, slightly granular.
5472	......do	243, 600	Neck of the stem of swivel. Fibrous.
5478	Swivel....................	308, 200	Pulled off head of stem. Fibrous 90 per cent, granular 10 per cent.
5479	......do	207, 800	Bale of socket at the weld, following the scarf.

BOTTOM CASTINGS FOR IRON BUOYS.

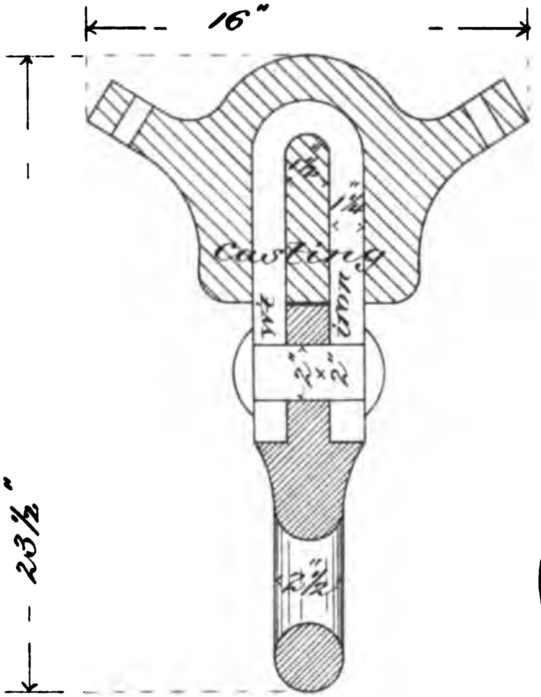
No. 5736

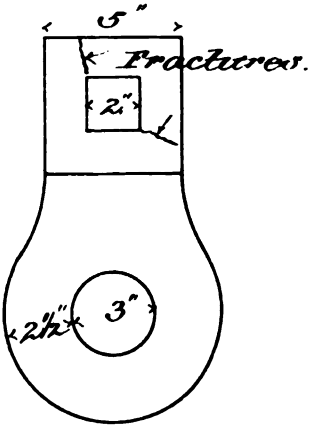

2"
Fracture of yoke.
Casting
2"
6"
17."
1¾" diam.
1¾"
Fractures in casting
Casting
5"
Wt iron

No. 5736



No. 5737





No. 5736.

BOTTOM CASTING WITH ADJUSTABLE SHACKLE.

Under 169,200 pounds tension the rim of the casting, on opposite sides and under the two parts of the wrought-iron yoke, began to fracture.

There were successive reports of fracturing cast iron under loads of 175,900 pounds, 188,000 pounds, and 210,000 pounds, and pieces were detached from each side of the casting, the lines of fracture extending through five rivet holes each.

At 213,000 pounds tension one part of the wrought-iron yoke fractured, disabling the attachment provided to secure the casting to the testing machine.

The shackle remained intact at the end of the test.

No. 5737.

BOTTOM CASTING WITH ADJUSTABLE EYE FOR FIRST-CLASS BUOY.

Tensile strength, 129,900 pounds.

Fractured the wrought-iron eye, tearing out the metal in front of the 2" x 2" square pin hole.

WIRE ROPE.

Samples of rope furnished for the elevator of the Washington Monument.

599

No. 5487.

Ends of rope secured in cast-iron conical-shaped sockets, by means of wedges.

Length between sockets, 8′ 1½″.

Diameter of rope, 1½″.

Six strands with hemp core.

Tensile strength, 123,100 pounds.

Fractured wires at face of socket.

No. 5488.

Ends of rope secured in cast-iron sockets, in same manner as No. 5487.

Length between sockets, 8′ 1½″.

Diameter of rope, 1½″.

Six strands with hemp core.

Tensile strength, 121,400 pounds.

Fractured wires at face of socket.

No. 5522.

Total length, 8′ 10″.

Diameter of rope, 1½″.

Six strands, of nineteen wires each, with hemp core.

Secured in testing machine by clamping between cast-iron dies 18″ long, grooved to fit the wire strands.

Tensile strength, 125,100 pounds.

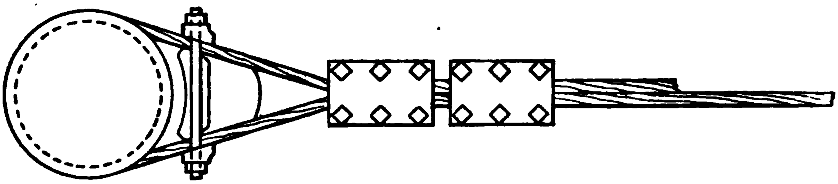
Fractured two wire strands 2 feet from face of cast-iron dies.

No. 5523.

Total length, 8′ 10″.
Diameter of rope, 1½″.
Six strands of nineteen wires each, with hemp core.
Secured in testing machine with same dies as No. 5522.
Tensile strength, 123,500 pounds.
Fractured two wire strands from 2″ to 3″ from face of cast-iron dies.

No. 5544.

Methods of securing ends for testing.



Diameter of rope, 1½″.
Six strands with hemp core.
Tensile strength, 130,600 pounds.
Fractured at inside face of second clamp.

TENSILE STRENGTH OF NICKEL STEEL WIRE MANUFACTURED BY CARNEGIE, PHIPPS & CO., LIMITED, PITTSBURG, PA.

No. 5548.

Diameter, ″.245.
Sectional area, .0471 square inch.
Gauged length, 10″.
Specimen straightened in rolls from a coil.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
235	5,000	0.	0.	0.	0.	Initial load.
471	10,000	.00015	.00015	....	....	
706	15,000	.00038	.00023	....	....	
942	20,000	.00058	.00020	....	....	
1,177	25,000	.00074	.00016	....	....	
1,413	30,000	.00093	.00019	....	....	
1,648	35,000	.00113	.00020	....	....	E.=30,610,000.
1,884	40,000	.00129	.00016	....	....	Elastic limit.
2,119	45,000	.00180	.00051	.00039	....	
2,355	50,000	.00273	.00093	....	....	
2,590	55,000	.00651	.00378	.00480	....	
2,826	60,000	.019	.01249	....	....	
3,061	65,000	.028	.009	....	....	
3,297	70,000	.039	.011	....	....	
3,532	75,000	.054	.015	....	....	
3,768	80,000	.085	.031	....	....	
3,944	83,740	....	....	....	....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,740
Elastic limit per square inch of original section	do...	40,000
Elongation per inch after rupture	inch..	.120
Elongation per inch under strain at elastic limit	do...	.00129
Reduction in diameter at point of rupture	do...	.075
Reduction in area after rupture, per cent of original section		51.8
Position of rupture		1¼″ outside the gauged section

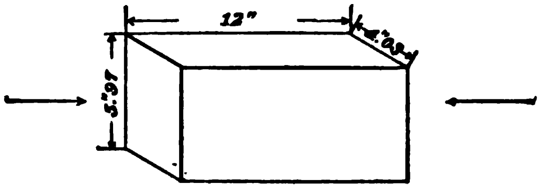
Character of broken surface, silky. Cracks along surface in the vicinity of fracture in two lines on opposite sides of the wire where thin fins had been rolled down.

NATURAL STONES.

The stones tested hot were slowly heated in a sheet-iron muffle by means of gas burners. They were taken from the muffle and immediately tested in the open air.

CAPE ANN GRANITE.

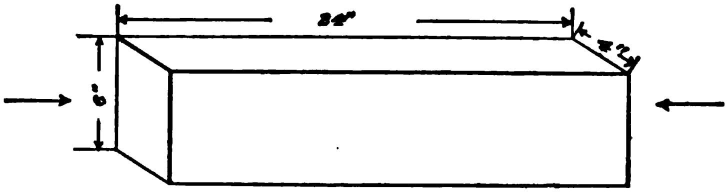
No. 5676.



Not heated.
Sectional area, 24.06 square inches.
Ultimate strength, 417,300 pounds=17,340 pounds per square inch.

CAPE ANN GRANITE.

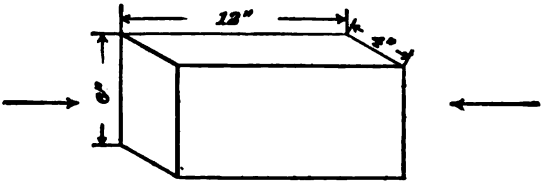
No. 5773.



Temperature, about 720° Fahr.
Sectional area, 24 square inches.
Ultimate strength, 275,200 pounds=11,467 pounds per square inch.

QUINCY GRANITE.

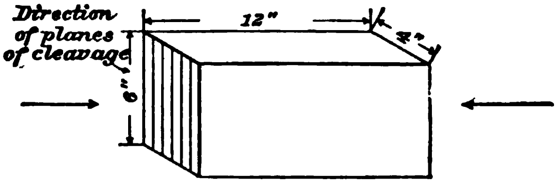
No. 5777.



Temperature, about 440° Fahr.
Sectional area, 24 square inches.
Snapping sounds were heard at 243,000 pounds compression.
Ultimate strength, 390,900 pounds=16,287 pounds per square inch.
Pyramidal fracture.

MONSON SLATE.

No. 5776.



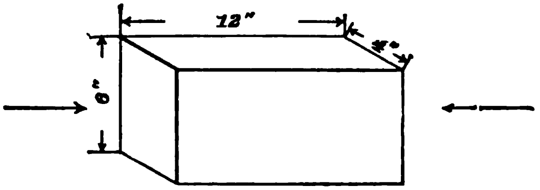
Temperature, about 440° Fahr.
Sectional area, 24 square inches.
Ultimate strength, 232,000 pounds=9,667 pounds per square inch.
Laminated fracture following the planes of natural cleavage of the stone.

When taken out of the muffle and placed on a sheet of asbestus board preparatory to adjustment in the testing machine, being exposed at the time to an atmospheric temperature of 95° Fahr., two longitudinal cracks opened, one from each end of the specimen.

The cracks extended into the stone from 3 to 4 inches each.

OHIO SANDSTONE.

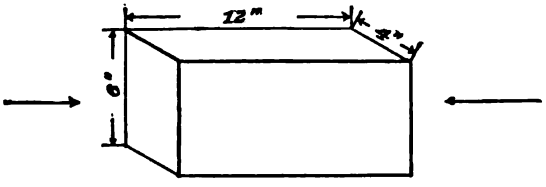
No. 5778.



Temperature, about 435° Fahr.
Sectional area, 24 square inches.
Snapping sounds under 181,000 pounds compression.
Ultimate strength, 183,900 pounds=7,663 pounds per square inch.
Pyramidal fracture.

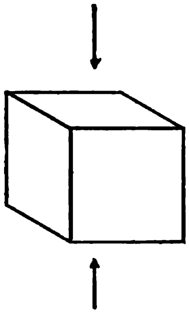
VERMONT MARBLE.

No. 5779.



Temperature, about 435° Fahr.
Sectional area, 24 square inches.
Ultimate strength, 320,900 pounds=13,271 pounds per square inch.
Explosive fracture under the maximum load.

COMPRESSION OF LIMESTONE CUBES FROM KELLY ISLAND, LAKE ERIE, AND USED IN THE CONSTRUCTION OF 800-FOOT LOCK AT SAULT STE. MARIE, MICH.



Compressed surfaces faced with plaster of Paris.

No. of test.	Marks.	Dimensions.			Sectional area.	First crack.	Ultimate strength.	
		Height.	Compressed surface.				Total.	Per square inch.
		Inches.	*Inches.*	*Inches.*	*Sq. inches.*	*Pounds.*	*Pounds.*	*Pounds.*
5663	0	2.98	2.98	2.98	8.88	105,800	105,800	11,910
5664	1	2.99	2.99	2.99	8.94	115,280	115,280	12,890
5665	3	2.98	2.98	2.98	8.88	112,490	112,490	12,670
5666	4	2.95	3.00	2.98	8.94	58,000	74,100	8,290
5667	6	3.00	2.97	2.97	8.82	89,000	96,900	10,980
5668	17	2.98	2.98	2.98	8.88	111,260	111,260	12,530
5669	22	2.97	2.96	2.99	8.85	111,590	111,590	12,610
5670	27	3.00	2.98	2.98	8.88	117,200	117,200	13,200
5671	30	2.98	2.98	2.99	8.91	128,200	129,300	14,500

Pyramidal fractures.

CHEMICAL COMPOSITION OF NATURAL STONES AND CEMENTS.

Description.	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	Na_2O	K_2O	SO_3	P_2O_5	CO_2	MnO	Loss.
Sandstone:												
Potomac red	76.41	4.35	15.54	0.85	1.15			None	None			2.20
Portland red	72.95	4.12	12.82	5.57	2.40			do	do			2.14
Ohio	91.20	1.14	6.24	0.73	0.63			do	do			0.06
Slate, Monson	54.24	8.39	24.71	5.23	2.59	1.43	0.72	2.03	do		0.50	0.16
Bluestone, North River	79.30	5.34	13.49	0.51	0.90			None	do			0.46
Granite:												
Cape Ann	81.05	2.71	14.70	1.10	Trace			do	do			0.44
Quincy	81.10	4.72	12.60	1.14	do			do	do			0.44
Worcester	78.81	1.50	15.92	1.17	0.45			do	do			2.15
Limestone, Hoozier Buff Oolitic	2.40	0.33		50.50	3.37			Trace	do	43.34		0.06
Marble:												
Vermont	1.64	0.21		52.09	2.00			0.58	do	43.00		0.48
Lee	1.00	0.20		23.00	27.98			0.64	do	46.64		0.54
Cement:												
Portland	18.88	11.57		62.69	2.75			1.12		3.45		0.04
Hoffman	24.60	10.50		39.31	15.08			1.37		9.14		None.
Norton	25.35	10.48		38.75	15.63			1.27		8.50		0.02
Cement	25.17	13.25		33.17	21.00			1.08		6.88		None.

EXPERIMENTS ON TRANSMISSION OF HEAT THROUGH NATURAL STONES AND BLOCK OF SPRUCE WOOD.

Dimensions of stones, 4″ x 6″ x 12″. Dimensions of spruce block, 7″ x 7″ x 14″.

Stones were packed in sawdust in a wooden box, and exposed to the temperature of the open air, about 16° Fahr., over night. The pockets in ends of stones were drilled ⅜″ diameter by 4″ deep before exposure to the open air; the pocket in end of spruce block was bored ten minutes before block was brought into the testing room. Boring the pocket sensibly heated the block.

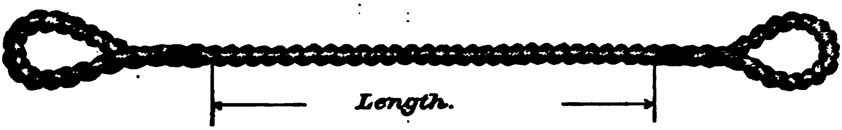
The temperatures were ascertained by means of thermometers inserted in the pockets.

Length of time in testing room.		Temperatures.													Remarks.
		Testing room.	Ohio sandstone.			Cape Ann granite.			Monson slate.			Spruce block.			
			Actual.	Total increase.	Successive increase.	Actual.	Total increase.	Successive increase.	Actual.	Total increase.	Successive increase.	Actual.	Total increase.	Successive increase.	
Hrs.	*Min.*	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	
....	....	....	24	....	....	27.5	....	....	27.3	....	....	....	....	....	In open air.
....	10	59	24.7	.7	.7	28	.5	.5	27.3	0.	....	....	....	....	Brought into the testing room.
....	15	....	24.8	.8	.1	28.3	1.3	.8	27.8	.5	.5	....	....	....	
....	20	....	26.6	2.6	1.8	30.2	2.7	1.4	29.0	1.7	1.2	....	....	....	
....	25	....	28.4	4.4	1.8	31.5	4	1.3	30.2	2.9	1.2	....	....	....	
....	30	....	30.2	6.2	1.8	32.7	5.2	1.2	31.1	3.8	.9	29.5	....	....	
....	35	....	31.5	7.5	1.3	33.8	6.3	1.1	32.0	4.7	.9	23.8	— 5.7	—5.7	
....	40	....	33.6	9.6	2.1	34.9	7.4	1.1	33.6	6.3	1.6	20.5	— 9	—3.3	
....	45	....	34.9	10.9	1.3	36.3	8.8	1.4	34.7	7.4	1.1	19.8	— 9.7	— .7	
....	50	....	36.3	12.3	1.4	37.2	9.7	.9	35.5	8.2	.8	19.6	— 9.9	— .2	
....	55	....	38.1	14.1	1.8	38.5	11.0	1.3	36.7	9.4	1.2	19.5	—10.0	— .1	
1	5	....	40.3	16.3	2.2	40.3	12.8	1.8	38.5	11.2	1.8	....	....	....	Spruce block cut down to 4″ x 6″.
1	15	62	42.8	18.8	2.5	42.3	14.8	2	40.1	12.8	1.6	21.5	— 8.0	+2.0	
1	35	....	46.2	22.2	3.4	45.3	17.8	3	43.2	15.9	3.1	22.7	— 6.8	1.2	
1	50	63	48	24.0	1.8	46.8	19.3	1.5	44.6	17.3	1.4	25.2	— 4.3	2.5	
1	55	....	49.3	25.3	1.3	47.8	20.3	1	45.7	18.4	1.1	27	— 2.5	1.8	
2	10	64	50.7	26.7	1.4	49.1	21.6	1.3	47.1	19.8	1.4	29.5	0.	2.5	
2	35	....	53.4	29.4	2.7	51.8	24.3	2.7	49.6	22.3	2.5	35.5	+ 6.0	6.0	
3	15	65	56.5	32.5	3.1	55	27.5	3.2	53.1	25.8	3.5	42.4	12.9	6.9	
4	15	67	60.1	36.1	3.6	59	31.5	4	57	29.7	3.9	49.7	20.2	7.3	
5	15	68	62.4	38.4	2.1	61.7	34.2	2.7	60.1	32.8	3.1	55.6	26.1	5.9	
6	15	....	64.8	40.8	2.4	63.7	36.2	2	62.4	35.1	2.3	58.0	28.5	2.4	
7	10	69	66.0	42	1.2	65.1	37.6	1.4	63.7	36.4	1.3	60.4	30.9	2.4	

CORDAGE.

MANILA AND RUSSIAN HEMP FROM WATERVLIET ARSENAL (SAMPLES OF OLD ROPE).

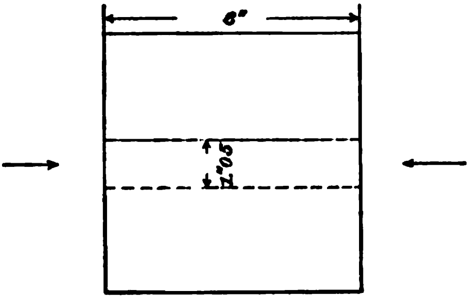
Prepared for testing by splicing eyes in ends and wetting the splices before testing.

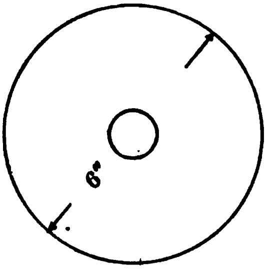


No. of test.	Kind of rope.	Marks.	Circumference.	Number of strands.	Yarns per strand.	Lay one turn in inches.	Length.
			Inches.				*Feet.*
5681	Manila	B	4⅛	3	63	3⅛	6
5682	....do	A	6⅛	3	128	4⅛	3⅛
5683	Russian hemp	D	6	3	89	4⅛	4
5684	....do	C	6⅛	3	88	5⅛	4⅛

No. of test.	Tensile strength.	Fractured.
	Pounds.	
5681	11,350	1 strand at end of splice.
5682	18,180	Do.
5683	18,620	2 strands at end of splice.
5684	19,820	1 strand at middle of length.

COMPRESSION OF RUBBER BUFFERS.





Buffers branded: "Newton Rubber Co. Factory, Newton Upper Falls, Mass."

No. 5769.

Weight, 10 pounds 7½ ounces.

Applied loads.	Height.	Total compression.	Successive compression.	Permanent set.	Middle diameter.
Pounds.	*Inches.*	*Inches.*	*Inch.*	*Inch.*	*Inches.*
0	6.00	0.	0.	0.	6.00
200	5.89	.11	.11	....	6.04
400	5.83	.17	.06	....	6.07
600	5.75	.25	.08	....	6.12
800	5.70	.30	.05	....	6.16
1,000	5.64	.36	.06	....	6.18
2,000	5.29	.71	.35	....	6.43
3,000	4.90	1.10	.39	....	6.70
4,000	4.54	1.46	.36	....	6.99
5,000	4.24	1.76	.30	....	7.25
6,000	4.00	2.00	.24	....	7.47
7,000	3.78	2.22	.22	....	7.68
8,000	3.55	2.45	.23	....	7.94
9,000	3.38	2.62	.17	....	8.15
10,000	3.24	2.76	.14	....	8.32
11,000	3.07	2.93	.17	....	8.54
12,000	3.00	3.00	.07	....	8.66
13,000	2.92	3.08	.08	....	8.76
14,000	2.83	3.17	.09	....	8.89
15,000	2.76	3.24	.07	....	8.99
16,000	2.70	3.30	.06	....	9.10
17,000	2.64	3.36	.06	....	9.18
18,000	2.60	3.40	.04	....	9.27
19,000	2.55	3.45	.05	....	9.36
20,000	2.51	3.49	.04	....	9.45
18,000	2.53	3.47	—.02	....	....
16,000	2.58	3.42	—.05	....	....
14,000	2.63	3.37	—.05	....	....
12,000	2.72	3.28	—.09	....	....
10,000	2.84	3.16	—.12	....	....
8,000	3.02	2.98	—.18	....	....
6,000	3.38	2.62	—.36	....	....
4,000	4.08	1.92	—.70	....	....
2,000	5.00	1.00	—.92	....	....
0	5.93	....	....	.07	6.12

No. 5770.

Weight, 10 pounds 9½ ounces.

Applied loads.	Height.	Total compression.	Successive compression.	Permanent set.	Middle diameter.
Pounds.	*Inches.*	*Inches.*	*Inch.*	*Inch.*	*Inches.*
0	6.00	0	0	0	6.00
200	5.94	.06	.06	....	6.04
400	5.88	.12	.06	....	6.08
600	5.81	.19	.07	....	6.12
800	5.76	.24	.05	....	6.16
1,000	5.69	.31	.07	....	6.19
2,000	5.36	.64	.33	....	6.41
3,000	4.99	1.01	.37	....	6.68
4,000	4.65	1.35	.34	....	6.94
5,000	4.34	1.66	.31	....	7.20
6,000	4.10	1.90	.24	....	7.43
7,000	3.87	2.13	.23	....	7.65
8,000	3.68	2.32	.19	....	7.86
9,000	3.50	2.50	.28	....	8.05
10,000	3.34	2.66	.16	....	8.21
11,000	3.22	2.78	.12	....	8.38
12,000	3.11	2.89	.11	....	8.53
14,000	2.93	3.07	.18	....	8.77
16,000	2.80	3.20	.13	....	8.98
18,000	2.68	3.32	.12	....	9.18
20,000	2.58	3.42	.10	....	9.35
0	5.95	....	....	.05	6.12

CHEMICAL ANALYSES OF STEEL, WROUGHT IRON, AND CAST IRON.

Description of material.	Chemical composition.								Remarks.
	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.	
	Total.	Graphitic.	Combined.						
Wrought iron marked S-220	0.049	0.010	0.039	None.	0.118	0.020	0.141	....	See report of 1882, p. 192, for original tension test.
Cast iron—12″ mortar shell	3.004	1.434	1.570	0.310	1.073	0.160	0.590	....	First ladle.
	3.021	1.382	1.639	0.304	0.950	0.156	0.600	....	Last ladle.
Do	2 941	2.233	0.708	0.265	0.896	0.127	0.434	None.	Heat No. 1.
Do	2.984	1.987	0.997	0.124	0.056	0.186	0.356	....	Heat No. 2.
Do	3.155	2.927	0.228	0.598	0.998	0.094	0.566	0.006	Heat No. 50.
Gun scrap	2.569	1.887	0.682	0.387	0.820	0.025	0.558	....	
8-inch round shot (old)	2.683	2.448	0.235	1.360	2.931	0.035	0.652	....	
Muirkirk pig iron	3.467	3.073	0.394	0.872	0.858	0.066	0.233	None.	
Do	2.751	2.042	0.709	0.750	0.750	0.105	0.480	....	
Katahdin pig iron	2.666	1.832	0.834	0.100	1.170	0.069	0.478	....	
Do	3.116	2.344	0.772	0.138	1.026	0.096	0.573	....	
Alabama pig iron	2.386	1.382	1.004	....	3.205	0.010	....	....	
Do	3.265	2.803	0.462	1.068	4.097	0.005	1.195	....	
Ohio pig iron	2.988	2.787	0.201	....	2.754	0.006	....	....	
Shaparoon pig iron	2.492	1.870	0.622	0.252	0.578	0.048	0.620	....	
Standard Steel Co.'s tool steel 1$\frac{7}{16}$″×$\frac{9}{16}$″	0.897	0.028	0.869	0.148	0.111	0.010	0.024	....	
Cold rolled steel for endurance tests	0.075	None.	0.075	0.320	0.025	0.061	0.091	0.010	
Helical spring, $\frac{5}{16}$″ diameter	1.047	0.156	0.891	0.356	0.294	0.043	0.068	0.012	
Helical spring, $\frac{7}{16}$″×$\frac{5}{16}$″	1.198	0.226	0.972	0.191	0.125	0.014	0.077	0.014	
English Belleville spring	0.776	0.046	0.730	0.615	0.012	....	....	....	
French Belleville spring	....	....	0.286	0.710	0.257	....	....	....	
Spring steel in stock at arsenal	0.697	0.076	0.621	0.582	0.075	0.025	0.058	0.012	
Spring steel from Lynn	0.635	0.012	0.623	0.455	0.326	0.015	0.045	....	
Steel disks from Belleville springs	0.684	0.054	0.580	0.532	0.037	0.030	0.092	....	To be manufactured at Watertown Arsenal.

TESTS MADE FOR PRIVATE PARTIES DURING THE FISCAL YEAR ENDED JUNE 30, 1892.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1891.				
July 2	Riveted joints	Camden Iron Works	Camden	N. J.
	Eyebar	Keystone Bridge Co	Pittsburg	Pa.
8	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
11	Copper wire	U. S. Cold Wire Rolling Co	Chicago	Ill.
16	Wrought iron	Houghton & Richards	Boston	Mass.
17	Chain	Thos. Morton	New York	N. Y.
24	Staybolt iron	Rhode Island Locomotive Works	Providence	R. I.
	Cast iron	Woodbury Merrill Patten & Woodbury	Boston	Mass.
27	Steel rails	P. H. Dudley	New York	N. Y.
	Bricks	F. Chillingworth	New Haven	Conn.
	Granite	Alex. McDonald & Son	Cambridge	Mass.
Aug. 3	Cement	Atlas Cement Co	New York	N. Y.
	Steel plates	Wm. Allen & Sons	Worcester	Mass.
4	Terra cotta	Peabody & Stearns	Boston	Mass.
	Brick	J. L. Smithmeyer	Fort Monroe	Va.
11	Staybolt iron	Rhode Island Locomotive Works	Providence	R. I.
12	Bricks	Granite State Brick Co	Boston	Mass.
	do	Philadelphia & Boston Face Brick Co.	do	Mass.
13	Terra cotta	Peter Condon	New York	N. Y.
	Paving blocks	H. Gore & Co	Boston	Mass.
14	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
18	do	do	do	Mass.
24	Bricks and stone	F. Chillingworth	New Haven	Conn.
25	Insulators, etc	The Gould and Watson Co	Boston	Mass.
	Aluminum bronze	The Aluminum Brass and Bronze Co.	Bridgeport	Conn.
Sept. 1	Cast iron	Chatham Furnace Co	Chatham	N. Y.
	Brass rod	Union Metallic Cartridge Co	Bridgeport	Conn.
	Wrought iron	B. M. Jones & Co	Boston	Mass.
	Steel plates	Wm. Allen & Sons	Worcester	Mass.
3	Fireproofing	W. M. Kasson	Boston	Mass.
7	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
	Shackle	James B. Mills	Rockland	Me.
14	Insulators	The Gould and Watson Co	Boston	Mass.
15	Steel plate	Edwd. Kendall & Sons	Cambridgeport	Mass.
17	Fireproofing	W. M. Kasson	Boston	Mass.
19	Rail and rail joint	Nickerson Fish Plate Co	do	Mass.
	Wrought iron and steel plates.	Cunningham Iron Works Co	do	Mass.
22	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
23	Wrought iron plates.	Cunningham Iron Works Co	Boston	Mass.
29	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
Oct. 3	do	do	do	Mass.
14	do	Hartford Steam Boiler Inspection and Insurance Co.	Boston	Mass.
	Wrought iron and side rod.	Houghton & Richards	do	Mass.
15	Steel plate	Edwd. Kendall & Sons	Cambridgeport	Mass.
20	Steel plates	Wm. Allen & Sons	Worcester	Mass.
24	Pine wood	A. Gottlieb & Co	Chicago	Ill.
29	Columns	Jones & Laughlin, limited	do	Ill.
31	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
	Wrought iron bars	E. W. Serrell	New York	N. Y.
Nov. 6	Bricks	J. H. Warden	Chicago	Ill.
7	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
9	Brass and bronze	American Tool and Machine Co	Boston	Mass.
12	Chain cable	Riehlé Bros. Testing Machine Co	Philadelphia	Pa.
18	Hardened steel	Ferracute Machine Co	Bridgeton	N. J.
19	Wrought iron	Eastern Forge Co	Boston	Mass.
23	Steel plates	Wm. Allen & Sons	Worcester	Mass.
Dec. 1	Brick	National Brick and Tile Co	Bradford	Pa.
	Chains	Fitchburg R. R. Co	Boston	Mass.
	Granite	Cross G. Smith	do	Mass.
7	Steel plates	Rogers Locomotive and Machine Works.	Paterson	N. J.
8	do	Edwd. Kendall & Sons	Cambridgeport	Mass.
	Sheet copper	Chas. R. Fletcher	Boston	Mass.
9	Yellow metal	Revere Copper Co	do	Mass.
11	Cast copper	Herbert Howell	do	Mass.
12	Belting	Main Belting Co	do	Mass.
	Wrought iron plates.	Erskine Ramsey	Pratt Mines	Ala.
19	Composition metal	Bath Iron Works	Bath	Me.
	Belting	Main Belting Co	Boston	Mass.
31	Steel plates	Wm. Allen & Sons	Worcester	Mass.

PRIVATE TESTS—Continued.

Date.	Material.	For whom located.		
		Name.	City.	State.
1892.				
Jan. 4	Steel castings	W. W. Whitcomb	Boston	Mass.
	Aluminum alloys	Prof. J. W. Richards	Bethlehem	Pa.
5	Bricks	Eastern Hydraulic Press Brick Co.	Winslow	N. J.
6	Brick, stone, and piers.	Wm. Sooy Smith	Chicago	Ill.
	Terra cotta	Corning Clay Works	St. Paul	Minn.
8	Pine wood columns.	Pepperell Manufacturing Co	Biddeford	Me.
9	Steel plates	Wm. Allen & Sons	Worcester	Mass.
21	Steel bars	Washburn Car Wheel Co	....do	Mass.
	Yellow metal	Revere Copper Co	Boston	Mass.
Feb. 4	Paving bricks	Muscatine Terra Cotta Lumber Co.	Muscatine	Iowa.
5	Steel bar	Washburn Car Wheel Co	Worcester	Mass.
	Yellow metal	Revere Copper Co	Boston	Mass.
10	Steel plate	Edwd. Kendall & Sons	Cambridgeport	Mass.
	Steel plates	Whittier Machine Co	Boston	Mass.
	....do	Holyoke Steam Boiler and Iron Works.	Holyoke	Mass.
	Angle iron	Boston Bridge Works	Boston	Mass.
	Cast iron	Wm. Allen & Sons	Worcester	Mass.
	Staybolt iron	Rhode Island Locomotive Works	Providence	R. I.
	....do	Houghton & Richards	Boston	Mass.
	Wrought iron rods and nuts.	H. S. Robinson	....do	Mass.
11	Steel plates	E. D. Leavitt	Cambridgeport	Mass.
17	Terra cotta	New York Architectural Terra Cotta Co.	New York	N. Y.
	Cast iron	Potter Machine Works	Newton Upper Falls.	Mass.
18	Paving bricks	H. Gore & Co	Boston	Mass.
19	Carriage axle	B. M. Jones & Co	....do	Mass.
23	Railroad axles	N. Y., N. H. & Hartford R. R. Co	New Haven	Conn.
24	Railway chairs	Burnham & Duggan Railway Appliance Co.	Boston	Mass.
	Riveted joints and steel plate.	Hartford Steam Boiler Inspection and Insurance Co.	Hartford	Conn.
	Steel plate	Edwd. Kindall & Sons	Cambridgeport	Mass.
27	Cast iron column	Laconia Co	Biddeford	Me.
	Wire rope	C. U. Cotting	Boston	Mass.
	Iron and steel	Lehigh Valley R. R. Co	South Bethlehem	Pa.
	Steel plate	Edwd. Kendall & Sons	Cambridgeport	Mass.
Mar. 1	Sewer covers	City of Boston	Boston	Mass.
3	Cast iron	Golding & Co	....do	Mass.
4	Bricks	New York Architectural Terra Cotta Co.	New York	N. Y.
	....do	E. D. Leavitt	Cambridgeport	Mass.
7	Spirally welded tube.	Spiral Weld Tube Co	East Orange	N. J.
8	Bricks	New York Architectural Terra Cotta Co.	New York	N. Y.
14	Wrought iron bars	Edwd. Kendall & Sons	Cambridgeport	Mass.
15	....do	Kinsley Iron and Machine Co	Canton	Mass.
	Iron plates	Pettee Machine Works	Newton Upper Falls.	Mass.
16	Steel plates	E. D. Leavitt	Cambridgeport	Mass.
25	Wrought iron columns.	A. J. Gustin	South Boston	Mass.
26	Paving brick	Shawmut Clay Manufacturing Co	Ridgway	Pa.
28	Steel and iron bars	Kinsley Iron and Machine Co	Canton	Mass.
31	Steel plates	E. D. Leavitt	Cambridgeport	Mass.
Apr. 4	....do	......do	....do	Mass.
6	Angle iron	Boston Bridge Works	Boston	Mass.
	Steel plates	William Allen & Sons	Worcester	Mass.
	....do	Carnegie, Phipps & Co., Limited	Pittsburg	Pa.
	Rods with cap nuts.	H. S. Robinson	East Boston	Mass.
7	Wrought iron bars	Houghton & Richards	Boston	Mass.
8	Spirally welded tube.	Spiral Weld Tube Co	East Orange	N. J.
15	Fireproof granite.	William F. Stedman	South Boston	Mass.
	Bricks	J. C. Hubinger & Co	Keokuk	Iowa.
16	Steel bars	E. D. Leavitt	Cambridgeport	Mass.
23	Wrought iron and steel bars.	Edwd. Kendall & Sons	....do	Mass.
	Steel plates	Cunningham Iron Works Co	Boston	Mass.
	....do	Carnegie, Phipps & Co., Limited	Pittsburg	Pa.
	Artificial stone	Carhart & Blanchard	New York	N. Y.
	Pole insulator	Revere Rubber Co	Boston	Mass.
	Chain	Memphis Artesian Water Co	Memphis	Tenn.

PRIVATE TESTS—Continued.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1892.				
Apr. 25	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
26	do	E. D. Leavitt	do	Mass.
May 9	Artificial stone	Carhart & Blanchard	New York	N. Y.
10	Chain	J. B. Carr & Co	Troy	N. Y.
	Brass tube	American Tube Works	Boston	Mass.
	Steel plates	E. D. Leavitt	Cambridgeport	Mass.
12	Insulators	Revere Rubber Co	Boston	Mass.
27	Rubber belting	J. H. Lane & Co	do	Mass.
28	Insulators	Revere Rubber Co	do	Mass.
31	Steel rails	P. H. Dudley	New York	N. Y.
June 1	Riveted joints, steel plates, bronze.	Hartford Steam Boiler Inspection and Insurance Co.	Hartford	Conn.
3	Steel rails	P. H. Dudley	New York	N. Y.
7	Bricks	New England Steam Brick Co	Barrington	R. I.
8	Chain swivel	Bradlee & Co	Philadelphia	Pa.
	Steel plates	Boston Bridge Works	Boston	Mass.
16	Wire rope	E. G. Aikman	New York	N. Y.
18	Wrought iron bars	Houghton & Richards	Boston	Mass.
23	Wire joints	American Bell Telephone Co	South Boston	Mass.
28	Stay bolt	George H. Lloyd	Boston	Mass.
29	Cement	Lehigh Valley R. R. Co	Jersey City	N. J.
30	Card clothing	Mechanical Fabric Co	Providence	R. I.

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